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ABSTRACT

This collection of four papers on the applicability of bibliographic theory to bibliographic instruction is introduced by Ross Atkinson, who sees a shift away from political and pedagogical concerns in bibliographic instruction. In "Pragmatic Bibliography," Patrick Wilson contrasts wholesale or comprehensive bibliography (the compilation of national and trade bibliographies, library catalogs, and abstracting and indexing journals) with pragmatic bibliography (the activity of one person engaged in a specific limited inquiry). Frances L. Hopkins, in "Bibliographic Instruction as a Liberal Art: An Application of Patrick Wilson's Theory of Pragmatic Bibliography," presents a rationale for teaching bibliographic instruction as a liberal art and provides an outline of a proposed program of instruction in bibliographic inquiry. In his paper entitled "On the Nature of Literatures: A Synergetic Attempt," Conrad H. Rawski describes scientific and research literatures as a complex system of interconnected parts. A 123-item bibliography is included. In "Shaping a Bibliographic Instruction Program for Undergraduate Science Students: Applications of a Model of the Structure of the Scientific Literature," Thomas Kirk applies Rawski's theory to the design of an ideal program and presents an outline of such a program. A summary of the four papers by Ross Atkinson and background information on the speakers conclude the document. (ESR)

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BACK TO THE BOOKS: BIBLIOGRAPHIC INSTRUCTION AND THE THEORY OF INFORMATION SOURCES

Papers Presented at the 101st Annual Conference of the American Library Association

ACRL - Bibliographic Instruction Section

Edited by Ross Atkinson

Association of College and Research Libraries
American Library Association

1983

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INTRODUCTION
by
Ross Atkinson

The following papers, delivered 11 July 1982 at the annual program meeting of the Bibliographic Instruction Section, ACRL, are intended to provide some insight into the applicability of bibliographic theory to bibliographic instruction.[1] The first paper, written by Patrick Wilson, presents a theory of bibliography from what may best be described as a social-humanistic perspective. This theory is then applied by Frances Hopkins to bibliographic instruction as a liberal art. In the third paper Conrad Rawski posits quite a different theory of bibliography from a more scientific point of view. Thomas Kirk, in the final paper, applies Professor Rawski's theory to the design of an ideal program of bibliographic instruction for undergraduate science students.

Although the term "bibliography" has many meanings, it is being used here to refer to that subject, aspects of which bibliographic instruction librarians are responsible for teaching in the classroom. The purpose of the following papers, therefore, is to establish and apply some of the fundamental theoretical attributes of our subject. Such work on theoretical bibliography for purposes of bibliographic instructon should have been initiated long ago. The fact is, however, that throughout most of our history we have been obliged by our peculiar circumstances to devote the majority of our energies to matters other than our subject. Until very recently our concerns have centered all but exclusively on politics and pedagogy.[2] The acquisiton and

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[1]The program was planned by the 1982 Conference Program Planning Committee, Bibliographic Instruction Section, which consisted of Ross Atkinson, John Collins, Carolyn Dusenbury, and Charles Getchell.

[2]For a few diverse examples of the new conceptualism

application of such political and pedagogical skills have necessarily led to an emphasis on packaging rather than content, on rhetorical proficiency rather than bibliographic understanding. Our knowledge of political and especially of pedagogical techniques has as a result completely surpassed our knowledge of bibliography.

Politics and pedagogy have, to be sure, served us well in our effort to gain access to the classroom, but they alone are insufficient to sustain the bibliographic instruction movement. Doubts as to the legitimacy and necessity of bibliographic instruction persist both inside and outside the library, and such doubts will not be dispelled by political maneuvers or by reference to our conspicuous ability to teach. The defence, maintenance and extension of what we have gained depends rather upon our ability to define, promote, justify and develop our subject, the subject of bibliography, the subject we claim as our unique area of expertise, and upon which we based our application for admission to the classroom in the first place. If we choose to ignore this exigency, then all of the effort made and skill acquired in the past decade will have been for nothing: the potential of bibliographic instruction will remain unrealized, its purpose obscure, its legitimacy suspect, and its future uncertain.

The time has come, therefore, for a shift in perspective. Our concern with the teaching of our subject must give way to a concern with the subject we are teaching. We can no longer afford to continue to conceal an inadequately developed subject behind increasingly sophisticated methods of presentation. We need to get back to where we started. Back to bibliography. Back to the books. Back to the record. We need to investigate thoroughly such fundamental

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that is beginning to displace the previous preoccupation with politics and pedagogy, see Jon Lindgren,"Toward Library Literacy," RQ, 20 (Spring 1981), 233-35; Pamela Kobelski and Mary Reichel, "Conceptual Frameworks of Bibliographic Instruction," Journal of Academic Librarianship, 7 (May 1981), 73-77; "Think Tank Recommendations for Bibliographic Instruction," College and Research Libraries News, 42 (December 1981), 394-98; Frances L. Hopkins, "A Century of Bibliographic Instruction: The Historical Claim to Professional and Academic Legitimacy," College and Research Libraries, 43 (May 1982), 192-98.

concepts as "bibliography," "records," "subjects," and "literatures" if we seriously propose to claim them as comprising our exclusive are of responsiblity in the academy, and if we honestly intend to teach our students how to use them.

How then do we go about effecting such a shift? Where do we start? There are doubtless several places to start, but regardless of where we begin we cannot avoid having recourse to some form of bibliographic theory. This is true for two reasons. First, theory is a prerequisite for any subject. Without theory there are only pieces . It is theory alone that relates the pieces to each other, transforms them into components, and produces thereby a subject. Second, whether we like it or not, whether we realize it or not, bibliographic theory is all we in bibliographic instruction have at our disposal anyway. We walk into the classroom armed ultimately only with bibliographic theory. The lists and sources we rely upon are to a great extent only tokens serving to illustrate an underlying theory. This must always be the case, for in the classroom, as opposed to the reference room, it is our responsibility to supply our students with the ability to answer questions not yet posed . Only theory can provide that ability, and when our students leave our lectures, it is theory above all else that they must take with them: not lists of particular sources, but concepts and structures applicable to each new research situation; not a vocabulary of reference works, but a grammar of bibliography. That is what we owe our students, and that is what we owe ourselves. The following papers, it is hoped, will contribute to the inititation of an effort to attain such objectives.

PRAGMATIC BIBLIOGRAPHY
by
Patrick Wilson

I want to contrast two kinds of bibliographic work and say something in general about their interrelations. I think that this contrast is of central importance for bibliographic instruction, but I'll leave it to my colleague Fran Hopkins to say whether it really is.

What a bibliographer does can be analyzed into four basic processes: search for materials (books, journal articles, newspaper articles, and so on), selection of materials, description of materials, and organization of the descriptions. Any bibliographical job involves some combination of these processes, but not necessarily all of them. Within a library one may specialize in collection development, the bibliographical job of search for and selection of materials, or in cataloging, the bibliographical job of description of materials and organization of the descriptions. Making a bibliography usually involves all four of the basic operations. These operations have traditionally been at the core of the professional librarian's work. It's common to contrast reference work with bibliographical work, but I don't think the contrast is important; most reference work consists of making a bibliography that consists of one item, and then reading something from that one item. Most librarians are basically bibliographers, though they are certainly not the only bibliographers. (I take this as an historical fact about librarians, not as a necessary and eternal truth.)

The two kinds of bibliographical work that I want to contrast can be called <u>wholesale</u> bibliography and <u>pragmatic</u> bibliography. Wholesale bibliography -- you may prefer the more conventional term <u>comprehensive</u> bibliography -- is best illustrated by the making of national and trade bibliographies and library catalogs on the one hand, and of the bibliographies and abstracting and indexing services that inventory the scholarly or scientific output of an academic or professional field on the other hand. The National Union Catalog, the British National Bibliography, Chemical Abstracts, and the MLA Annual Bibliography are examples of wholesale bibliography. They are big, highly organized, continuing activities, resulting in

printed lists and computerized data bases; the results are general purpose bibliographies, made for anyone and everyone who may want to use them, but in a sense aimed at nobody in particular. Pragmatic bibliography, by contrast, is best illustrated by the activity of one person who is engaged in a specific, limited inquiry, scholarly or scientific or purely practical, and who takes time and effort to find materials that will be of help in the inquiry. The inquiry might be an attempt to discover something new, or might simply be an attempt to find out what, if anything, is already known on a subject. But in any case the bibliographical job is done to aid something else; it is not done for its own sake.

The differences between the two kinds of bibliographical work are striking. Wholesale bibliography by definition results in lists; pragmatic bibliography may have no visible result at all. If a list is part of what eventually results (for example, references in a published paper), the list may bear no close or direct relation at all to the preceding bibliographical work; I might end up citing nothing I did not already know about before I started work. As to procedure: wholesale bibliography can be simply a job of processing material that arrives automatically under standing arrangements, hence involving no search or selection, but simply description and organization. Pragmatic bibliography by contrast centers on search and selection. Wholesale bibliography is a full-time job for specialists--catalogers, abstractors, indexers for instance; pragmatic bibliography is done occasionally by most research workers as well as by librarians, teachers, professionals of all kinds, and notably students, especially graduate students. Of course this is why pragmatic bibliography, and its relation to wholesale bibliography, are of concern to us here today.

What about the relations between pragmatic and wholesale bibliography? One might think that pragmatic bibliography, whenever properly and efficiently done, would simply consist in making judicious use of wholesale bibliography. Is it not the point, or the prinicipal point, of making those large, expensive works of wholesale bibliography, to facilitate the work of the pragmatic bibliographer, the person who wants to find material that will be of use in his own work? Let us stipulate, as they say in law, that this is so. And no doubt there are many cases in which pragmatic bibliography can and should be simply a matter of identifying the appropriate wholesale works and making

intelligent use of them. But this is not the general rule; and it's important to be clear that it's not.

Let's focus on the bibliographical work done on his own account by an academic research worker. The academic researcher is a member of an academic discipline, interested in some sub-discipline within that discipline, doing work probably confined to one or two specialties within the sub-discipline. Those working in the same specialty form a community, often a tiny community; the other members of the community form the primary audience for any one individual's work. The kind of work one does is likely to be very similar to the kind of work done by others in the same specialty: the kinds of problems selected, the methods used to address the problems, the kinds of solutions considered acceptable, the whole style of work is likely to be shared by most if not all members of the specialty. And what the individual does is done with one eye on the other members of the group; they are the ones who are going to judge the work, and unless it fits their notions of what is interesting and good work, it will be without effect. The community's judgment extends to the use one makes of others' work, and so to the kinds of bibliographical work that will be required.

Now we have to think of particular pieces of pragmatic bibliography as embedded in a continuous process of trying to maintain a satisfactory degree of familiarity with the world of learning. The active research worker is intensely self-centered; what others are doing is of interest primarily as it affects one's own work, and what doesn't affect one's own work can be ignored. Satisfactory familiarity with the world of learning is not familiarity with everything, but with what is likely to affect one's own work.

First, you will want to have, and will have acquired over time, an adequate grasp of the <u>useable</u> past of work in your specialty: not a detailed historian's knowledge of the past, for most of the past might be irrelevant now, but a knowledge of so much as still makes a difference. Second, you will want to be familiar with what others in your own specialty are doing, whether they are doing the same thing you are trying to do, or doing work distinct from but parallel to yours in a neighboring part of the same territory. And third, you'll want to be familiar with work that can contribute to your own work though it is in a quite different area and style. Others may provide intellectual tools that you can use, or theories or

evidence or examples that you find helpful, or may simply stimulate your thinking by offering ideas, questions, hypotheses to explore. Now useful items might be found almost anywhere, and one might think that finding them would be a very arduous job. But in fact you'll have an idea of where useable ideas are most likely to be found, and you'll ration your attention to various fields according to how likely you think it to be that a field will produce something you can use. One field you'll look into very occasionally, not really expecting to find much; another field you'll keep an eye on constantly. You don't need to maintain the same degree of familiarity with every field of inquiry. You want to maintain the highest degree of familiarity with work in your own specialty: expert familiarity, in the area of your greatest expertise. You want to maintain a working familiarity with those lines of inquiry in which useful results are most likely to occur: working familiarity meaning enough familiarity to allow you to understand what's happening and how it can be used in your own work. And you want to maintain a nodding familiarity, a rough idea of what sort of thing is going on, with less promising lines of work. Quite unpromising lines of work you can forget about entirely. So you have a map of the world of research, very detailed in a few parts, fairly detailed in others, sketchy in more, and with large areas left quite blank--labelled "science" or "humanities" or the like, depending on where you are.

Now you maintain the desired degrees of familiarity by reading and talking: scanning, looking at footnotes and references, and sometimes actually reading articles in specialist journals, general journals, book reviews, new books, talking to colleagues. This is a constant monitoring activity, a sort of directed browsing. And it's against this background of continual monitoring that any piece of pragmatic bibliography is undertaken. The setting is not one of blind ignorance but of an already detailed picture of the world of research. That picture is not simply one of who's doing what and who has already done what; it's a highly colored picture of reputations and of social standing, both of ideas and of people. It's a picture of work some of which is now thoroughly discredited and rejected, some of which is now accepted and admired; it's a picture of activity some of which is thought hopelessly old-fashioned, and some of which is coming into the height of fashion; it's a picture of work some of which is thought trifling and pedestrian and some of which is thought brilliant. It's a picture in which a few pieces of work occupy a large

space and in which most occupy practically no space at all, being eminently forgettable. This highly colored picture of the world of learning guides you when you decide that it would be useful to know more about some part of that world with which you have only a nodding familiarity.

What will you be looking for, and how will you find it? I think librarians tend to think that what one wants is a complete bibliography of the literature of the new field, the result of a comprehensive literature search. This is a big mistake. You want working familiarity with the results of research, but don't want to have to get it by reading everything. You'll want to start with summaries, reviews, syntheses, overviews that will organize and evaluate the often bewildering mass of original works of research. A single good starting place is what you want: a single good review or summary, which, if it doesn't tell you all you need to know, will direct you to the important parts of the primary literature. You may already have come across such a single good starting place, in the course of your monitoring activity. Or you may be able simply to ask a colleague who is familiar with that literature, and who can be that single good starting place, referring you to specific works in the light of what he knows about you as well as about the literature. Whatever you subsequently do is most likely to consist simply of following up footnotes and references. Footnote chasing is <u>the</u> preferred method of conducting a bibliographical inquiry.

Librarians often seem to be disappointed or shocked by how little use scholars and scientists make of the apparatus of wholesale bibliography; but no one has shown that their method of bibliographical search, entirely by-passing wholesale bibliography, is always, or usually, or even often worse than reliance on wholesale bibliography. If one tries to educate a future specialist to rely on wholesale bibliography, one is trying to get him to do what he won't need to do, and probably will prefer not to do.

But not everyone is a specialist doing research, and not everyone is going to be one. Let's turn now to the situation of the non-specialist, not engaged in a continuing line of professional research, but making a single, isolated foray into the published literature to aid in doing some single job. The variety of possible cases is endless; to simplify things, let's think of three degrees of ambition. First take the case of what

I'll call the Reporter, who simply wants to find out what has been written on some subject, in order to get a picture of what is thought about some matter by those who have explicitly studied the matter. This is the sort of case for which wholesale bibliography seems intended and most suitable. If we suppose that the ambition is not to discover every last word that has ever been said on the subject, an ambition that the shallow indexing we provide could not satisfy, but simply to find major discussions explicitly directed at the given subject, then judicious use of wholesale bibliography seems just the thing. The most judicious use will still be to look for someone else's summary, if one exists, or someone else's evaluative bibliography giving recommendations for reading in major sources, if one exists. But this is the sort of thing one can do in standard wholesale bibliographical works. The second case is that of the Commentator, who wants to do the same job as the Reporter but then wants to add a critical appreciation of the situation, a critical evaluation. This opens up new kinds of questions. It calls for adopting some critical stance or position, some basis for criticism, and unless one simply decides to use one's own common sense and already acquired stock of knowledge and opinion and value, opens up the possibilty of searching not for more discussion of the subject of interest but for anything that would provide or suggest a critical position: an ill-defined job for which wholesale bibliography seems hardly promising as an aid. But let's skirt that difficulty and go on to the still more ambitious jobs. For in practice the possibility of searching for new critical positions or principles probably doesn't arise in the mind of the Commentator, who is quite satisfied with the stock of views he already has. Now consider the job of the Investigator, one who proposes a question to the literature and undertakes to see what answer can be given, not simply from what people have said explicitly on the topic, but from whatever they have said on anything that might contribute to an answer. The aim is to satisfy oneself about what <u>can</u> be said, using what <u>has</u> been said, not only explicitly on the questions but on anything that can be seen or made to be relevant to the quesiton. In this kind of case, the texts for which you are looking are texts that are <u>functionally</u> related to your question, but they need not be <u>topically</u> related; you want material you can use; and the things you can use may well have topics that are apparently quite unrelated to the topic of your question. (For example: I recently came upon a paper on misleading metaphors in linguistics that I find enormously useful

in understanding certain problems in information science. No train of see-also references could be expected to connect the topics.) If you have to rely on wholesale bibliography, you're having to rely on works whose primary basis of organization is topical, when what you want and need is something whose primary basis of organization is functional. Straightforward search strategies, starting from a narrow description of your question and gradually widening it, are not likely to work well. The difficulty of the job is not only that the bibliographical works aren't designed to show the kind of functional relations you're interested in. It's that the job is an intrinsically ill-defined, even an indeterminate one. The job of the pragmatic Investigator is one that is, as often as not, tentative, exploratory, experimental. One's notions of what one is looking for change in the process of looking. One's ideas of possible uses change, as one learns more, through successes or failures. One thing leads to another, in unforeseeable ways. And it would often be better to speak of making things useful than of finding them useful. One makes connections, constructs bridges. Spotting potentially useful texts is very much an exercise of imagination and insight. And it's much dependent on luck, and on timing: a work found at the beginning of a search may have no apparent relevance at all, while if found toward the end, it would have large and obvious relevance. And the job is an open-ended one; there is usually no clear stopping point; a pragmatic search of this Investigative kind could go on forever, and does not only because it is pragmatic, subject to the limits of time and energy alloted to the job.

There is a further crucial problem in this kind of bibliography. Having spotted a text that one thinks one could use, the question remains: but should one use it? Can it be trusted? Will it bear the weight I want to place on it? We tend to assume that this must be decided solely by evaluation of the text on its own terms, by a kind of internal criticism: by examining the methodology, the technique, the strengths and weaknesses of the arguments, and so on. But this is certainly not the whole story even for the mature scholar, and can't be the whole story for the non-specialist. Everyone is an outsider to most subjects of study and relies on the word of others as to whether something can be trusted, taken seriously, relied on, or not. Of course this crucial question of reliability, of cognitive standing, is not something that wholesale bibliography can help us to answer; the

wholesalers are neutral, noncommittal. So having to rely on wholesale bibliography would mean having to rely on what was arranged the wrong way and unhelpful about the value of the things it listed.

I've intentionally pictured this sort of bibliographical job as one that is ill-defined, ill-structured, chancey, risky, messy. And so it often is, at least in my own experience. But there are two ways of approaching the job, and one of them simplifies it considerably. You can try to do this job as if you were a member of a specialist group, trying to imitate their ways; or you can do it as a free spirit, an independent operator not interested in imitating the conventions and prejudices of a particular specialist group. Graduate students certainly, and undergraduate students sometimes anyway, presumably want to take the first approach: to act as novice specialists. If they can discover the cognitive map of the world of research that is shared by members of the specialist group they want to imitate, they will know where to look for useable materials and what kinds of materials are considered useable; and if they can discover the social standing of the ostensibly useable materials they find--the reputation of an author or of a particular text, the views of the insiders about the acceptability or unacceptability of the work--they can safely accept or reject it. The aim of the novice specialist is not to exercise his own judgment but to get his judgment to conform to that of the specialists; and that is the aim of the specialists as well, in their role as teachers. The initial stages of education, which can last well into graduate school, are enforcement of conformity; only after one has shown that one has learned the rules of the game and correctly applies socially accepted ideas of what's good and bad can one be set free to exercise one's own judgment, now properly moulded. Though this is not the way either specialist or novice would put the matter, the initially ill-defined task of Investigative bibliography can be made relatively manageable if the novice can attain the narrow-mindedness of the specialist: the specialist's views about what can be entirely ignored and what is most promising.

The free spirit, the independent operator, is clearly in a different position. He too wants to have a cognitive map of the world of research, wants to figure out where to look for useable materials, and has to decide whether what he finds can and dare be used. But these things he has to decide and discover for himself, not by imitating so far as possible the attitudes and

practices of a particular specialist group. When it comes to selection, the novice will try to guess at the received view; the independent will decide for himself. Note that there are no universal canons of utility and value that the independent investigator can apply; there are no universal 'methods of research' for him to learn. Rather, different specialties have different and wildly various notions of what the value of other people's work is and how and where it can be used. If you put yourself outside the ranks of any particular specialty, there is nothing to hang on to in the way of universal standards. This is a dizzying situation, avoided by those who attach themselves as novices to a particular specialty. Life is simpler inside than outside.

If, as I claim, wholesale bibliography is not well suited, because of its topical arrangement and value-neutrality, to the work of the investigative bibliographer, what use can he make of it? Sustained and systematic use of the wholesale bibliographies is often, I think, a great waste of time; but a series of brief raids into them, exploring different fields, approaches, leads, possibilities, will often be smart strategy. A long and systematic search may be pointless, where a quick raid, getting out as fast as possible with a few references that may provide further leads, may be rewarding. What the active researcher accumulates over years of directed browsing can't be accumulated briefly by novice or independent; but perhaps the best alternative, or one good alternative, is to move rapidly from one bibliography to another, briefly sampling and tasting, and trying to enlarge one's sense of structure and possibility, and finding the occasional reference that may itself lead one in a rewarding direction.

I draw no firm conclusions from all this either about the final utility of wholesale bibliography or about bibliographic instruction. But I'm led in two directions: first, toward thinking that novice specialists have to get their more advanced bibliographic instruction from specialists, and this they will get not by explicit instruction but by osmosis; second, toward thinking that librarians really do have something to offer the independent investigator beyond the most elementary introduction to bibliographical work. Because we're not committed to any specialist line on the organization of research or the utility of work done by this or that group to the answering of particular questions, we may be the best able of any group to help people prepare themselves to orient themselves to novel

situations and explore unknown territories. If we can supress our tendencies to think in terms of making complete topically oriented bibliographies, and keep firmly in mind that the ideal form of bibliographical organization is functional not topical, we may help the independent investigator to learn to make effective, fast, and light-handed use of unwieldy instruments. And that would be well worth trying to do.

Bibliographical note: This paper is in part based on Patrick Wilson and Mona Farid, "On the Use of the Records of Research," Library Quarterly 49 (1979): 127-45. Some of the problems alluded to here are discussed in detail in Patrick Wilson, Second-hand Knowledge: An Inquiry into Cognitive Authority (Westport, Conn.: Greenwood Press, forthcoming).

BIBLIOGRAPHIC INSTRUCTION AS A LIBERAL ART: AN APPLICATION OF PATRICK WILSON'S THEORY OF PRAGMATIC BIBLIOGRAPHY

by
Frances L. Hopkins

INTRODUCTION

If we want students to gain lasting benefit from bibliographic instruction (BI) we must teach them something more than how to use specific reference tools for particular courses or subject fields.

Many of us believe that statement; the question is, what else should we teach? Those who have looked into learning theory for ways of improving the long-range effectiveness of BI have brought back an all-important principle: if we want to enable our students to transfer what they learn in a particular academic situation to the solution of new problems--especially to new problems in post-academic life--we should explicitly identify the general concepts we want them to transfer and we should explicitly organize those concepts within a framework that invests them with larger meaning.

Today's program is based on the assumption that it will be both fun and valuable to develop BI in this direction. It was Ross Atkinson's excellent idea that there is no better place to start than with the subject we nominally teach, bibliography itself. Professor Wilson was asked to present a theory of bibliography from a humanistic viewpoint; my assignment is to apply his theory to the practical development of bibliograhic instructon. Specifically, I must try to derive from Wilson's theory a framework for teaching reference tools and skills in such a way that students can grasp underlying general concepts about bibliographic research that will help them cope with many different research situations.

Professor Wilson's paper, as you no doubt recognize, confronts me with something of a paradox: how can I apply to the conceptual development of BI a theory that seems to deny that BI can teach research concepts? Indeed, 'seems' is much too weak a word. We had better face up directly to the fact that Wilson <u>does</u> deny it; he denies that general research concepts that transcend disciplines are even possible. As we would expect, Wilson's reasoning is sound, clear, and convincing. I think we must accept his theory, and I

think we should accept it gratefully because it clarifies an important issue in BI.

Does this mean that there is nothing I can say by way of application? Does it mean that BI really has nothing more to offer than annotated lists of reference sources? I don't think so, and I am not sure that Professor Wilson thinks so either. Although his paper focused on the conclusion that librarians cannot conceptualize a general research methodology, at the very end he offered the suggestion that we can do something else. In this suggestion I think Wilson's theory does provide a framework--almost a mandate, I like to think--for developing BI beyond the tools and methods level in the humanities.

IMPLICATIONS OF WILSON'S THEORY

1. The Proper Domain of BI in the Humanities

Most of us have heard from various faculty members in the humanities fragments of the argument that Wilson has made here concerning research. The position, in essence, is that research is guided by the implicit norms and values of an academic discipline; that these can be learned only from scholars, and only "by osmosis"; and that therefore no general research methods can be taught by those outside the discipline. This characterization of research seems intuitively true of most fields in the humanities, but I think many of us in BI have been perplexed by it, feeling that it obscures a real issue without our being able to say exactly how. Wilson's detailed exposition of pragmatic bibliography makes it plain why this is so. The problem that emerges is in large part semantic: we in BI have taken the word 'research' from the domain of scholarship and have been using it in a misleading way.

Wilson is sensitive to the semantic problem; he attributes it to our having a different model of research from the scholar's. We librarians, he explains, do <u>wholesale</u> bibliography for the general pupose of providing subject access to the literature. The model of research we have drawn from this is the comprehensive literature search on a designated topic. Library users, in contrast, do <u>pragmatic</u> bibliography, in which each user's purpose is individual, the user's purpose and the materials that will serve it are often not designated by the same subject labels, and the user's notion of the subject often changes in the course

of looking. Wilson suggests--with good reason--that librarians have not been well attuned to these pragmatic facts of research;quite naturally, he seems to fear that when we talk about teaching research methods, we have in mind teaching systematically the comprehensive search of wholesale bibliographies.

Of course, Wilson is right that librarianship has been permeated with the model of the comprehensive subject search. But it is also true that this is a model that the BI movement has been working to reject. Although our disentanglement is just beginning, the conscious model in BI has shifted from the subject search to the idea of research as a process in which purpose, level, depth, and ambiguity are recognized parameters. Our effort now is toward expressing this more complex model operationally. Our approach to bibliographic research is becoming more person-centered than subject-centered, more interested in solving problems than in trimming them to fit some arbitrarily established catagories.

But there is a further difficulty in what is meant by the word "reseasrch." Wilson sketches the various levels of pragmatic bibliography in the humanities in terms of the research objectives of scholars and students. He depicts the scholar's method of research as continuous browsing and rumination, punctuated by episodes of active footnote chasing, all guided by a largely tacit cognitive map that is shared with a community of colleagues within a specialty. The chief object of such research is not retrieval of materials about a subject, but the stimulation of new concept associations that will extend the cognitive map or illuminate areas of interest on it. Thus, humanists, and scholars in many social science fields as well, often bypass bibliographic tools because comprehensive retrieval is irrelevant to their needs and conventional subject terminology does not get at their often idiosyncratic interests.

Students, Wilson says, do bibliographic work at three levels. At the lowest, or Reporter stage, they merely retrieve information on a given subject with no particular intellectual perspective to guide them. This pretty well matches the librarian's model of bibliographic research, but it is not at all what scholars would call research. We might for the moment call it "research" in quotation marks. At the Commentator stage, still innocent of any systematic canons, students still do mere "research" in quotes, but

in addition to information on a subject they also search out evaluative materials that help them formulate a critical position. At the Investigator stage, which begins at some point after the choice of major, students become apprentice scholars and for the first time begin doing <u>real</u> research--research, that is, without quotes. From then on they are engaged in discovering the cognitive maps sanctioned by their mentors and molding their own judgments to them. Thus, within a discipline, a student learns to do research as one learns a craft--novice from master, by repeated trial and critique, not explicitly, but through a largely unconscious process of socialization. And what of the independent researcher? Lacking membership in a discipline, Wilson says, the independent receives no cognitive map; and without one, <u>real</u> research is impossible. So those rare independents who aspire to the Investigator level must develop their own cognitive maps during and through their research. They, also, cannot be taught an explicit methodology.

Wilson wants us to understand, I think, that BI can never substitute for academic mentoring as a means of trainging Investigators to do <u>real</u> research. This is a crucial point. I think we must recognize that research proper does belong to scholars and their acolytes, and I think we should resolve right now to leave the word "research" in their possession also. We have much more to gain by this than we have to lose. Because we have used the word "research" in a misleading way, scholars in many fields of the humanities have tended to see almost a dichotomy between our "research" in quotes and their research proper. Yet in concrete situations the distinction is neither clear nor consistent; we in BI see it more as a continuum. From our observation of people at work in libraries, we are conscious of research as a process involving many interdependent factors. Retrieval techniques, evaluative criteria, and insight come into play in different combinations and are guided by the cognitive map of a discipline or by the confused norms of everyday knowledge, depending on the researcher's place on the continuum. To keep this complexity in mind and to avoid the ambiguities of the term "research," we might well name this process "bibliographic inquiry." This accords with common usage, in which the term "inquiry" extends both to a mode of undergraduate learning and to sustained scholarly investigation. It also allows the BI initialism to signify the subject that we teach as well as the activity of teaching it: bibliographic inquiry is what we teach when we do bibliographic instruction.

2. Further Development of BI in the Humanities

Having established what the domain of BI cannot be, Wilson then offers a possible alternative--a potent suggestion for developing BI beyond its present limitations. At the end of his paper, Wilson suggested that our best approach may be to help students enlarge their sense of structure and of possibility through brief forays into bibliography. I see this as the connecting link we seek between specific tools and methods and an organizing framework that gives them larger meaning. The present content of BI concerns mainly <u>how to do</u> certain component parts of the inquiry process, such as selection and use of reference tools, locational procedures, and the conventions of citation. The conceptual framework suggested by Wilson's term "structure" and "possibility" concerns <u>understanding</u> the individual inquiry process as part of the larger social process of scholarship and knowledge. Recognizing this intuitively, many of us are already using in BI a few concepts related to the larger process, such as the primary and secondary publication sequence and the structure of the literature of a discipline. But we have not linked individual inquiry with the larger knowledge process in a way that makes much sense to students. The notion of brief forays offers a teaching method for making this link explicit. An organized series of brief forays can lead students to use reference sources as illustrations of aspects or stages of the larger knowledge process. Later, BI related to their courses or to their major subject fields can lead students to use these same resources again in the process of individual inquiry.

The general structure of a BI program follows easily from this. Wilson grants that it is useful for librarians to teach basic retrieval methods at the Reporter level and to introduce the standard tools of a discipline at the Investigator level. At both these levels, how-to-do-it teaching should predominate to provide direct support for students' other academic work. Concentrated teaching <u>about</u> the bibliographic inquiry process should fall in between, when students are at the Commentator level. Retrieval skills are a necessary prerequisite, and understanding of bibliographic inquiry within the context of the larger knowledge enterprise should begin before students commit themselves to the norms and values of particular disciplines. For most students in a traditional four-year college program, the Commentator stage would span the sophomore and early junior years. As higher

education, in response to economic and demographic forces, reaches for more of the non-traditional education market, instruction about the bibliographic inquiry process will be equally appropriate for adults at the Commentator level who want to understand what is involved in developing responsible positions on social, professional, or private issues. A BI program that can teach all these learners to approach any inquiry, scholarly or not, with appreciation of the complexities and ambiguities involved, will improve the preparation of those destined for scholarship; but more important, it will make a contribution that is uniquely our own to an educated citizenry. I think it can lead ultimately to the realization of a cherished goal: namely, development of BI into a recognized component of general education in the liberal arts curriculum.

BI AS A LIBERAL ART

General education can mean two things. In the narrow sense, it means instruction in subjects that are important for all students because they are instrumental for most other learning. BI is not yet widely recognized along with composition, basic math, and the new computer literacy as essential for general education in this sense. But it seems likely that successful prototype programs will continue to spread until well-planned how-to-do-it BI at the Reporter and Investigator levels eventually becomes the norm. General education in the broader sense means instruction that is intended to have more than practical utility. Its purpose is to increase students' awareness of the products and processes of culture and to develop critical and independent thinking in preparation for lifelong self-directed learning. It is this aspect of general education that has motivated the traditional liberal arts curriculum

Librarianship has had a parallel tradition. Both academic and public libraries intermix the products of the learned disciplines with those of journalism, government, private agencies, and popular culture, and they provide access to these materials in a situation free from authority or indoctrination. In keeping with this, librarians have historically advocated independent learning as an important complement of formal education and as a right and responsibility of free citizens. From the beginning of BI, contributing to general education in this borader sense has been an important

goal.[1] It has also been an elusive one; BI as a liberal art is not, as some have hoped, a natural byproduct of instrumental learning.

In academia, general education in the liberal arts has always had supporters, but their number and influence have varied with the degree to which discipline and professional specialization has been seen as threatening or full of promise. Right now, for at least three reasons, support of general education programs is on the upswing. First, there is the familiar complaint that specialization in the disciplines, admittedly advantageous at the graduate level, has produced curricula that shelter undergraduates from the conflicts and ambiguities of knowledge. As one educator recently observed, students can hear "every Monday, Wednesday, and Friday at 10 a.m. that human actions are radically free (in a course on existential ethics), and at 11 a.m. that all human actions are determined by...environment...(in a course in behavioral psychology), and never...need to make the two views confront each other."[2]

Second, because they are educated in a system that compartmentalizes knowledge, students usually come to take for granted their own major fields of study as models for truth. In particular, the majority who major in technical fields often discount "softer" knowledge as either trivial or dubious. When I did BI for a course

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[1]For example, in 1886, the librarian of Cornell University asserted that it was the "duty of a college library to teach the student how he may...at any time...seek out and use the books that have displaced or carried along the knowledge of his college days" and to "reveal...the fact that no professor's word is final." (Edwin H. Woodruff, "University Libraries and Seminary Methods of Instruction," Library Journal 11, September 1886:219-224.) Seventy years later, Patricia Knapp said that competence in library use should be considered a genuine libreral art. (Patricia Knapp, "A Suggested Program of College Instruction in the Use of the Library," Library Quarterly 26, July 1956:230.)

[2]Robert D. Marcus, "Undergraduates Can Stand the Heat, So Let Them into the Kitchen," The Chronicle of Higher Education, April 14, 1982, p.56.

in science and society, I found many students who believed that technical solutions to social problems do away with questions of value, and many more who believed that, in the absence of universal truths, value choices do not require any justification. Third, the influence of families, communities, and religion--agencies external to academia that have always given coherence to the lives of individuals by providing value systems--has been eroded.[3] Yet students are not taught to recognize that they are making individual choices in a changing world that earlier generations did not have to make, nor are they taught how to search out informaton and guidance when they are needed.

Obviously these are global problems that have to be attacked at many levels. One promising approach is to try to give students some perspective on knowledge itself. It can be made explicit that knowledge from one academic field may clash with knowledge from another; that no body of knowledge is a collection of true, unchanging facts; that disciplines concerned with values have systematic critical mechanisms of their own; and that value choices can be informed. Perhaps the best means of doing this is by instruction in the meta-disciplines of philosophy and sociology of knowledge, but those fields are too sophisticated and abstract to be presented concisely to the average sophomore or to adult learners whose interests may be mainly practical. BI that sets individual inquiry into the context of scholarship and knowledge as a whole can introduce students to this perspective through concrete examples.

CONCLUSION

So far I have presented only a rationale for bibliographic instruction as a liberal art, and there is too little time today to explore specific content. However, I have prepared a rudimentary syllabus, which appears as Level II in the Appendix to this paper, entitled "Outline of a Proposed Program of Instruction in Bibliographic Inquiry." Obviously, considerable content development would be necessary before such a course could be taught; but it is not entirely a pipe

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[3]Herman Niebuhr, Jr., "Teaching and Learning in the Eighties: the Paradigm Shifts," Phi Delta Kappan, January 1981, p.367-368.

dream. A general description of such a BI component has been included in a grant proposal submitted this year by a group of humanities and social science faculty members at my university who hope to establish a general education program specifically geared to self-directed lifelong learning. To my surprise, some members of the faculty committee in charge of the proposal, who seemed to have little understanding of how conventional BI might benefit their students, took quite readily to the notion of BI as a means of teaching about the nature of knowledge.

Although I am convinced that instruction about knowledge and inquiry can be an important dimension of BI, I do see it as experimental. It really amounts to teaching information science concepts at the undergraduate level, and would require, in the long run, continual monitoring of information science research in order to sythesize and reformulate selected parts for general education. Therefore, for maximum flexibility, it would be best to introduce it into a BI program as a separate course. In the beginning, the only links with how-to-do-it BI at other levels would be the use of the same tools or types of tools. As the course developed, it would undoubtedly turn out that parts of it should be incorporated into the other levels, so that further integration into the total program would occur in time.

Finally, I must remind you that I have made a long leap from Wilson's very brief suggestion; he is in no way responsible for the general education thrust of this proposed program or for any of its individual elements. But whatever the fate of my proposal, I remain grateful to Professor Wilson for clarifying the problem of conceptualizing BI in the humanities and for his consistent good humor during our almost year-long dialogue.

APPENDIX

Outline of a Proposed Program of Instruction in Bibliographic Inquiry

Orientation to the Library

A brief audio-visual presentation, entirely attitude-directed, of the library as a bibliographic system and of the librarian as its organizer and the user's guide and advocate.

Level I. Basic Methods of Bibliographic Inquiry

A lecture and series of library exercises given in conjunction with a freshman course (preferably composition) that requires a brief research report. Students select topics within a range of general subjects specified by the instructor so that the basic search strategy presented in the sequence of exercises will be appropriate and will result in a preliminary bibliography for each student's paper.

A. Lecture: Basic search strategy--main types of substantive and bibliographic reference sources, their functions and sequential use; finding topic ideas, altering the idea to fit the literature and the time available, focusing the topic as the inquiry proceeds.

B. Exercises:

1. Finding topic ideas - course readings, browsing classified bibliographies.

2. Using general and subject encyclopedias - for context, aspects, schools of thought, major contributors, terminology related to the topic; basic bibliography. Interpreting references to books and articles.

3. Using the card catalog to locate known books; interpreting catalog card elements.

4. Subject searching - explanation of imposed and keyword headings; subject tracings and LCSH; basic filing rules; finding topical bibliographies; searching computerized catalogs.

5. Wilson indexes - interpreting citations of journal articles and parts of books.

6. Criteria for evaluating the preliminary bibliography - date of publication in relation to topic, where and how often cited, book reviews, author credentials, reputation of publisher or journal.

7. Access procedures - locating books, bound journals, and microforms in the library; holds, recalls, interlibrary loan.

8. Consultation with the librarian - solving individual evaluation and access problems; special information needs (facts, statistics, etc.).

9. Explanation of the subject specialist's "control" of the literature. Review of the student's preliminary bibliography by a subject expert (professor or librarian), if possible.

10. Citing sources - why and how; plagiarism.

11. The Reporter and the Commentator - examples of both kinds of papers.

Level II. Knowledge and Bibliographic Inquiry
(a rudimentary syllabus)

A course of lectures, assigned readings, and exercises intended (a) to present knowledge as a complex and dynamic human enterprise that is influenced by value and practical considerations as well as by intellectual ones; (b) to help students appreciate the contributions of the academic disciplines, yet approach them critically with awareness of their limitations; and (c) to make students aware that reference sources are not only tools for retrieval but are also the tangible record of the evolution of knowledge. Examples and exercises use the same reference tools or the same types of tools as those introduced in Levels I, III, and IV.

A. Knowledge Processes and the Bibliographic Record

1. The knowledge cycle: the stages of generation, evaluation, dissemination, compilation, application and use in new research, diffusion, obsolescence, and possible resurrecton of knowledge (Figure 1).
2. The publication sequence of the research and reference literatures (Figure 2).
3. The development of disciplines and specialties and corresonding types of literature. (Examples: sociological theory groups, composition teaching as a specialty within English departments.)
4. The evolution of a concept or theory: the seminal book or paper, citations in subsequent literature, appearance in a discipline encyclopedia or dictionary, appearance as a formal subject heading, emergence in popular literature and perhaps in common parlance. (Examples: anomie, paradigm shift, burnout, etc.)

B. Scholarship and Bibliographic Inquiry

1. Characteristics of scholarly literature: the scholarly journal compared with professional, opinion, and popular periodicals; classified and selective bibliographies compared with general bibliographies.
2. Bibliographic systems: mixture of all levels and periods of literature in libraries; artificial compartmentalization of knowledge by classification systems; petrification of past stages of disciplines by subject headings; limited access to the research front.
3. Pragmatic bibliography: the scholarly researcher and the cognitive map; the novice "researcher's" need for methods of evaluating sources; the librarian as facilitator and advisor, but not proxy inquirer.
4. Primary and secondary sources: in the humanities, in the sciences; the inquiry sequence vs. the publication sequence (Figure 2).
5. Problems in inquiry:

   - Old secondary sources, unreliable for reference, become primary sources for history of a discipline (e.g., the Hastings Encyclopedia of Religion and Ethics).

- Lack of up-to-date encyclopedias and the economics of publishing.

- Treatment of a given topic by different disciplines (e.g., human freedom).

- Treatment of a given topic at different times within a discipline (e.g., IQ).

- Bias and inconsistency in reference sources (e.g., treatments of nonwestern religion and culture; factual inconsistencies between sources).

- Time lag in indexing, in subject terminology.

Level III. Bibliographic Resources of a Discipline

Lecture-workshop and handouts for majors in a discipline, covering relevant general and specialized reference sources (including computerized databases) and how to use them, gaps in the reference literature (e.g., lack of a recent dictionary or encyclopedia), conventional citation format for the discipline.

Level IV. Specialized Bibliographic Resources

Lectures, workshops, exercises, handouts in various combinations as appropriate for: (a) individual courses on interdisciplinary or specialized topics, or (b) groups of library users interested in special forms such as government documents, biographical sources, maps, etc.

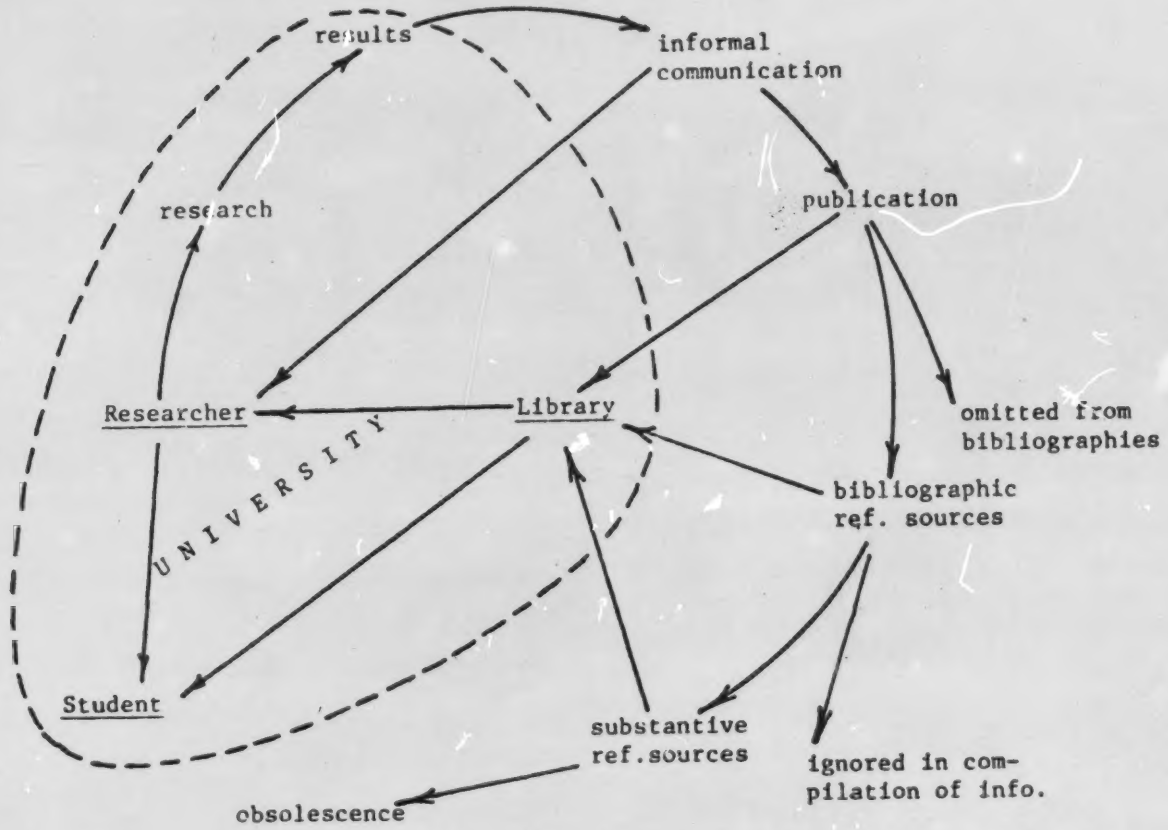
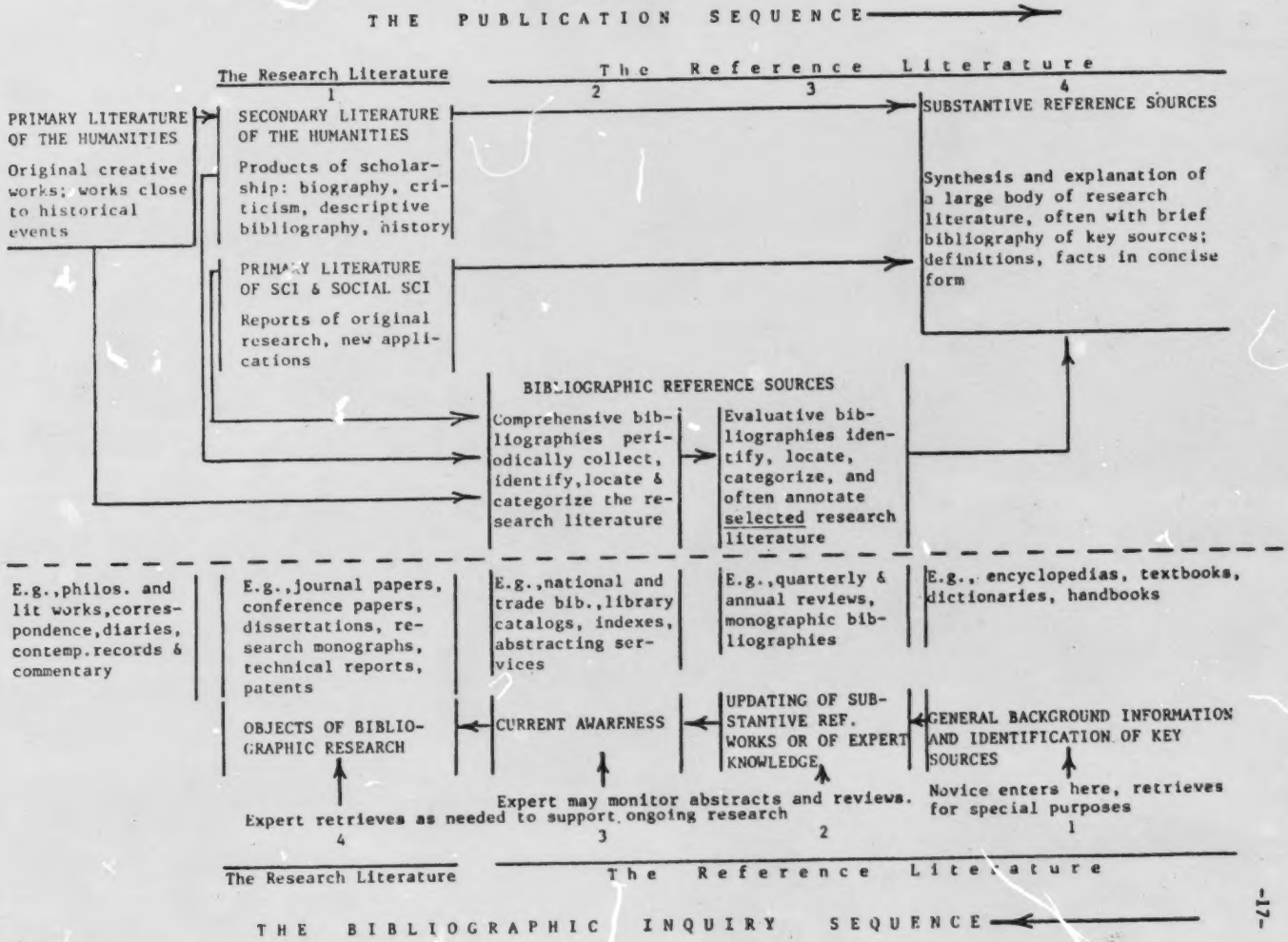


FIGURE 1. THE KNOWLEDGE CYCLE.

Adapted from D.A.Redmond, M.P.Sinclair, E.Brown, "University Libraries and University Research," College & Research Libraries 33(Nov 1972):449.

FIGURE 2.


THE PUBLICATION SEQUENCE
The Research Literature
1
The Reference Literature
2
3
4
PRIMARY LITERATURE OF THE HUMANITIES
Original creative works; works close to historical events
SECONDARY LITERATURE OF THE HUMANITIES
Products of scholarship: biography, criticism, descriptive bibliography, history
PRIMARY LITERATURE OF SCI & SOCIAL SCI
Reports of original research, new applications
SUBSTANTIVE REFERENCE SOURCES
Synthesis and explanation of a large body of research literature, often with brief bibliography of key sources; definitions, facts in concise form
BIBLIOGRAPHIC REFERENCE SOURCES
Comprehensive bibliographies periodically collect, identify, locate & categorize the research literature
Evaluative bibliographies identify, locate, categorize, and often annotate selected research literature
E.g., philos. and lit works, correspondence, diaries, contemp. records & commentary
E.g., journal papers, conference papers, dissertations, research monographs, technical reports, patents
E.g., national and trade bib., library catalogs, indexes, abstracting services
E.g., quarterly & annual reviews, monographic bibliographies
E.g., encyclopedias, textbooks, dictionaries, handbooks
OBJECTS OF BIBLIOGRAPHIC RESEARCH
CURRENT AWARENESS
UPDATING OF SUBSTANTIVE REF. WORKS OR OF EXPERT KNOWLEDGE
GENERAL BACKGROUND INFORMATION AND IDENTIFICATION OF KEY SOURCES
Expert retrieves as needed to support ongoing research
4
Expert may monitor abstracts and reviews.
3
2
Novice enters here, retrieves for special purposes
1
The Research Literature
The Reference Literature
THE BIBLIOGRAPHIC INQUIRY SEQUENCE

ON THE NATURE OF LITERATURES: A SYNERGETIC ATTEMPT

by
Conrad H. Rawski

Whenever aspects of reflective inquiry are being brought to bear on a subject that is 'professional' in the sense that it relates to professional 'services' and 'practitioners,' two basic aspects are involved: One, which Jeremy Bernstein calls science observed,[1] and which applies to the stance of the majority of this audience--and another, which, pace Dr. Bernstein, I shall call science observes, which happens to be the task assigned me by your chair person, Mr. Atkinson.

Let me first oblige science observed, and explain that 'synergy,' the noun behind the adjective in the subtitle of this paper, is a term, I think, coined by R. Buckminster Fuller, who defines it as

> behavior of whole systems unpredicted by the behavior or integral characteristics of any parts of the system when the parts are considered separately...(and as) scientifically discovered interrelationships of system parts...in no way suggested by separate inspection of any one part of the system.[2]

In other words, I shall attempt to deal with the cosmology of literatures, as it were, despite the fact that, as with all other human cosmological attempts, much must remain putative, and much, much more beyond our present ability to translate into action. But it is my hope that the mapping afforded by such an overview might clarify things, and show patterns, properties, relationships, and functions, that must be considered as we seek within the domains of fact, enlightened choices as professionals.[3] And this involves my science observes, which if carried out with sufficient rigor, may lead to unexpected, hence, not always welcome results--results which, nevertheless, inform.

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[1] Bernstein (1982).
[2] R. Buckminster Fuller (1981), p.251. A quasi-operational and somewhat indistinct interpretation of the term has recently been offered in Masuda (1981), p.104 et passim.
[3] Bunge (1967), vol. 1, pp.27-28.

Consider the subtitle of this program: "Bibliographic Instruction and the Theory of Information Sources." From a logical point of view, this invites a host of questions. Bear with me. The activity called 'bibliographic instruction' is to be related to a theory, i.e., "an intelligible, systematic, conceptual pattern,"[4] somehow pertinent to 'information sources,' whatever they might be. I say 'somehow' advisedly, because the 'theory of' clearly involves 'information sources' as subjects, topics, events, or what have you, on the one hand, and as a living system in terms of the static and dynamic empirical phenomena pertaining to 'information sources' on the other.[5] Thus questions result: 'informing whom;' 'of what;' 'in what way?' Do 'information sources' begin and end with a static set of properties? Do queries vary with the subject? Does the context defined by queries vary with the subject? How do ideas relate to the literatures, which record, display, transmit, and store them? These are random questions, hard to relate. We have very few precise, not to speak of formal, answers to these questions. Worse, we seldom consider them when immersed in professional parlance. (I still remember a session on materials selection, during which I, then young and foolish, asked what 'materials selection' meant, and was archly informed by an irritated discussant that "everybody in this room knows what it means.") If we continue to accept this, my paper is supererogatory. And so are all pious pronouncements about professional 'awareness,' 'change' and 'progress.'

THE WAY THINGS ARE[6]

Let me attempt a very simple mapping of the way things are--Bochenski's 'state of affairs,' which designates the modification and pattern of relationships characterizing that which <u>is</u> as <u>what it is</u>. Consequently, the state of affairs indicates also <u>what counts as information</u> in regard to both, its own situation and the relationships, or the absence thereof, to other situations (which, as such, may represent or relate to other states of affairs).[7] This seemingly fussy, abstract aside is important, since in all areas

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[4]Hanson (1961), p.121; Rawski (1973), pp.43-44.
[5]On the relation denoted by 'of,' cf. Woodger (1952), pp.27-29.
[6]Bridgman (1959).
[7]Bochenski (1965), chap. 1.

of human endeavor a new 'invention' of any kind must needs take its place amidst related inventions of an earlier date, which may result in a modified state of affairs that may profoundly affect subsequent inventions of this kind.

If we view knowledge, with Daniel Bell, as "a set of organized statements of fact or ideas, presenting a reasoned judgment or experimental result, which is transmitted to others through some communication medium in some systematic form"[8] --then a literature represents such public knowledge (the term is Ziman's)[9] in various states of organization. Its units record, store, display, and transmit the results of a complex process over time, which begins, reflexively, with query and judgment--with somebody privately envisioning a given knowledge, searching and casting about, as John Locke said,[10] and, in due time, articulating it as what may be called an information unit. Upon publication, this product of private action becomes a public literature unit that takes its place among previously produced related literature units, which constitute that "consensus of rational opinion over the widest possible field" on a given subject, topic, etc. that forms the matrix of all future contributions and discoveries.[11] This new literature unit may subsequently be interpreted positively or negatively, may cause resonance in other publications, produce spin-offs, be amplified, modified, challenged--or ignored, since, as N.R. Hanson knew, "it takes two to 'tell the truth;' one to tell and one to listen."[12]

The action system of all literatures can be approached in two ways: (1) in terms of all empirical data characterizing their nature; and (2) in terms of

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[8]Bell (1973), p.175.
[9]Ziman (1968), p.9; Ziman (1976), chap. 5. Note also Gruber (1974), chap. 1.
[10]John Locke, Essay i, 1, 10, as quoted in Buchler (1955), p.71.
[11]Ziman (1968), ibid. On action systems, Parsons & Platt (1973), chaps. 1 and 2.
[12]Cf. Buchler (1955), passim; Gruber (1974), p. 250; Kubler (1962), chap. 1. Interesting related ideas are addressed in Harold Bloom's theory of poetic creation with its notion of a willful misreading of earlier texts. Cf. e.g., Bloom (1976). The quotation is from Hanson (1961), p. 20.

the intellectual subject matter they contain. Both approaches permit identification of certain invariant properties in terms of which literatures may be described--and assessed.

(1) All literature units exhibit the basic properties of object, i.e., the constituting device O; content, i.e., the knowledge expressed to be recorded, stored, displayed, and transmitted C; and a use potential U. "O-C-U are correlative terms which hold true for any human literature, at any given point in time."[13] Before you dismiss this humble observation with a curt "elementary, my dear Watson," you should remind yourself that, as a consequence, any literature unit, no matter how and to what purpose it is used, must be used "as determined by given properties which derive from the object (O) designed for C and U; the content (C) designed for C and U; and the use potential (U) of this O and C."[14] (This should make some of us more cautious when we pontificate about "encyclopedias" or "dictionaries.")

(2) With respect to subject matter--any subject matter, literatures and their units address a body of knowledge in terms of

- basic subject matter and materials; objects; events and processes; activites; etc.
- conceptual structure
- ways in which the subject knowledge is produced
- comparison of these ways with those obtaining in other knowledge areas (to identify the dominant epistemic modes)

These are general concerns which obtain for all human making (in our case, the production of knowledge).[15]

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[13]Rawski (1977), p. 10.
[14]ibid. p.12. For greater detail cf. Rawski (1969), pp.97-98; Rawski (1973), pp.127-130.
[15]Rawski (1976), p. 177.

They relate to the purposive goals pursued in a literature or a particular literature unit, which are comprised in four, and only four, strata:

1. assertions concerning reality and confirmable truth, in form of observation statements and hypotheses (theoretical statements);

2. res facta: creative efforts (making) aimed at substantiation[16] of a virtual reality expressing private facts, imagination, fiction;

3. performance: the manual and intellectual actions needed to do 1 or 2;

4. criticism: evaluation of 1, 2, 3.[17]

Our list of strata shows that the public knowledge embodied in a literature requires a further distinction. There is the knowledge with a distinct bearing on the subject (strata 1, 2, 3); and there is the knowledge about knowing and doing the subject (stratum 4). (It is one thing to consider the mathematical systems pertinent to flexible programming and another to read Ulam's discussion of how Von Neumann arrived at this.)[18]

In crude strokes, these, are the enduring hallmarks of literatures. Their interplay reveals systemic relationships. But when it comes to considering function and process, we cannot continue to neglect the larger contexts of use which transcend the specific use potential, i.e., use in terms of the knowledge source and its O-C-U syndrome,[19] although even that underscores

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[16]The term is Gilson's; Gilson (1957), pp. 153-155.
[17]Rawski (1969), pp. 103-107. On this also, Buchler (1955), esp. pp. 70-71; Woodger (1952), Lecture 1; and Bunge (1959a), chap. 5; and idem in Scientific Thought (1972), chap. 12.
[18]Ulam (1976), pp. 198 et sequ. Cf. also Machlup (1980), pp. 19-30.
[19]"A syndrome is a concurrence of manifestations seen frequently enough to be more than a chance relationship." Cutler (1979), p. 39.

the basic thrust of a system which is directed at "someone else's mind."[20]

THE PHENOMENON OF USE

As soon as we remind ourselves that 'use' does not only imply the ability and power to use something (in the sense of using logarithm tables or knowing the language the book we want to read is written in), but also to carry out a purpose of action by means of[21] --which includes any purpose because of which we may seek out an item believing that it might be useful (i.e., of value) in the sense of promising to satisfy a presently felt need--we realize that 'use' is not determined by the knowledge source alone. If we assess the knowledge source from the user's standpoint, in terms of the user's notion, we discover a different dimension of 'use.' Here, 'use' implies selection which is based upon valuations of some kind made by individual users, and which we observe only after the fact . It is governed by motivations that are essentially private, introspective, relativistic, personal, and in constant flux.[22] Thus we must distinguish between manifest use of this sort and not manifest, i.e., source determined use. Within the constraints of a specified topic, e.g., Physician's Desk Reference, manifest use is likely to coincide with the use for which the literature unit is intended. But here too the possibility of not intended use exists, although it may not be manifest at a given time and place.

Source determined and manifest use may be related to Weinberg's discipline--mission duality, i.e., the fact that "information generated for one purpose is often useful for quite different purposes;"[23] and the search for knowledge motivated by interest intrinsic to the subject field of that knowledge, as opposed to a search motivated by "outside" interests extrinsic to this field.[24] All these dichotomous terms are useful indications in a general sense and may have specific application in certain situations. From a logical point of view, manifest use, not intended use, and all related

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[20] Machlup (1962), p. 30.
[21] Webster's Seventh New Collegiate Dictionary, articles 'use' n. 3 b. and vb. 4.
[22] Northrop (1947), p. 241.
[23] Alvin J. Weinberg in Kochen (1967), p. 42.
[24] Weinberg (1967), pp. 147-152.

terms, denote a continuum of valuations not necessarily predicated upon the characteristics of the knowledge system as represented by the knowing source.

For a subject area S and its literature we can anticipate intended use and formulate lawlike statements based on generic and specific properties.

> (Example: In the medieval art of tenth century Europe, Bernward of Hildesheim is a prominent figure; hence, there is a reasonable probability to expect a number of users interested in medieval art to desire, in fact, to have to desire in terms of their subject interest, information on and about Bernward: if the user is interested in subject S, then he can be expected to be interested in sub-subjects s1, s2,...with a 'probability' which may well be related to the position of s1, s2,...within the content structure of S.)

Manifest use permits no such predictions. Manifest use is observable only after the fact. It does not afford us a basis upon which to consider deductive consequences and to determine probabilities as in our example. Manifest use allows us to ground analytic efforts only upon the generic fact that each user has wants and that these order themselves. This, F.S.C. Northrop has shown, is essentially the case in economic science, which proceeds also "from assumptions reflecting very elementary facts of general experience."[25] As in classical economics, all basic statements concerning manifest use relate just to the generic property of the concrete wants (apart from their specific content and character), i.e., the fact that any user makes valuations of some kind, which in every instance do order themselves.[26]

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[25]Lionel Robbins, as quoted by Northrop (1947), p. 248. Cf. also Samuelson (1970), chap. 22.
[26]Northrop (1947), p. 241.

LIVING SYSTEMS

What we have described as a literature and its uses represents a living system. James Grier Miller views living systems as a special subset of the set of all possible concrete systems. Quoting Capra:

> Systems are integrated wholes whose properties cannot be reduced to those of smaller units. Instead of concentrating on basic building blocks or basic substances, the systems approach emphasizes basic principles of organization. Examples of systems abound in nature. Every organism--from the smallest bacterium through the wide range of plants and animals to humans--is an integrated whole and thus a living system. Cells are living systems, and so are the various tissues and organs of the body, the human brain being the most complex example. But systems are not confined to individual organisms and their parts. The same aspects of wholeness are exhibited by social systems--such as an anthill, a beehive, or a human family--and by ecosystems that consist of a variety of organisms and inanimate matter in mutual interaction. What is preserved in a wilderness area is not individual trees or organisms but the complex web of relationships between them.
>
> All these natural systems are wholes whose specific structures arise from the interactions and interdependence of their parts...
>
> Another important aspect of systems is their intrinsically dynamic nature. Their forms are not rigid structures but are flexible yet stable manifestations of underlying processes. In the words of Paul Weiss,
>
> the features of order, manifested in the particular form of a structure and the regular array and distribution of its substructures, are no more than the visible index of regularities of the underlying dynamics operating in its domain.

Weiss (1971), p. 284.[27]

Sophisticated considerations attach to this.[28] For us it is sufficient to note these somewhat technical distinctions and to consider their heuristic usefulness.

Viewed in the context of a living system, literatures emerge in the dynamic interplay of chance and law as results of "conservative" forces, but subject to certain dissipative processes. These can be comprehended in terms of permanent forms and patterns, as integral entities which are more than the sum of their parts, as, in turn, they constitute an overall state of affairs in organic life.[29] Like the realm of organisms, the realm of ideas (and its nonliving implements) exists in space and time, exhibits aspects of matter and energy (i.e., the capacity to do work), organized by information (in the sense of the negative of uncertainty), and is subject to an entropy law which, in essence, says

> that everything in the entire universe began with structure and value, and is irrevocably moving in the direction of random chaos and waste.[30]

We can seek out the structural properties of literatures and their subject matter, basic features, interdependencies, and the related processes--and study them along sychronic lines, or, diachronically, their behavior over time, with an eye on reversible and irreversible aspects.[31] We can engage in qualitative analysis or quantitative assessment of constituent types and features, or project literatures into broad environmental purviews, such as the nature, origin, and

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[27]Capra (1982), pp. 266-267. For a more rigorous description, see Miller (1978), p. 18. Cf. also Parsons & Platt (1973), pp. 8-10, et passim.

[28]E.g., Glynn Harmon in Debons & Cameron (1975), pp. 93-99.

[29]Eigen & Winkler (1981), chap. 6; Gatlin (1972), chap. 1; Miller (1978), p. 1036, 2.3. For a recent introductory sketch of "the systems view of life," Capra (1982), chap. 9.

[30]Rifkin (1980), p. 6. On a technical level, cf. the lucid presentations in Kubat & Zeman (1975); Carnap (1977); and Shaw (1979).

[31]On this, Kubler (1962), chaps. 2 and 3. Gardner (1973), pp. 24, 40-42. Note also Eugene Garfield in Rawski (1973), 380-402; and Wilson (1975), pp. 4-6.

growth of ideas and knowledge, or the related aspects of communication, and production, dissemination, and consumption. We can even base major policy decisions on behavioral traits of literatures that permit prediction.[32]

The static and dynamic parameters of a living system provide the frame of reference for all this, and create an aura of certainty that may tempt us to anticipate the happy conclusion of our efforts to attain intelligibility by discovering general principles, by means of which the individual phenomena can be explained and predicted.[33] But what holds true in principle cannot be plausibly implemented as a matter of course. Our humble epistemic map shows an uncomfortably large number of the white patches indicating terra incognita --unknown territory. But work is being done, some of which is good and promising.

ONGOING RESEARCH

As Slamecka has shown, ongoing research is motivated by socio-economic, politico-humanistic, techno-scientific, and axiological concerns, foremost among them the realization that, in our times, knowledge is a critical resource with an ever-increasing demand and cost for its provision.[34] A related concern is that, equally ever-increasing, problem of utilization posed by the bewildering growth of literatures[35] and the all but random mass of computerized data cumulations, which have antiquated the traditional approaches to literatures.[36] The somewhat ad hoc tabular overview below attempts to indicate some of the main topics of ongoing research and samples of the related literature. Intensive work on some of these topics is being done at Case Western Reserve University.

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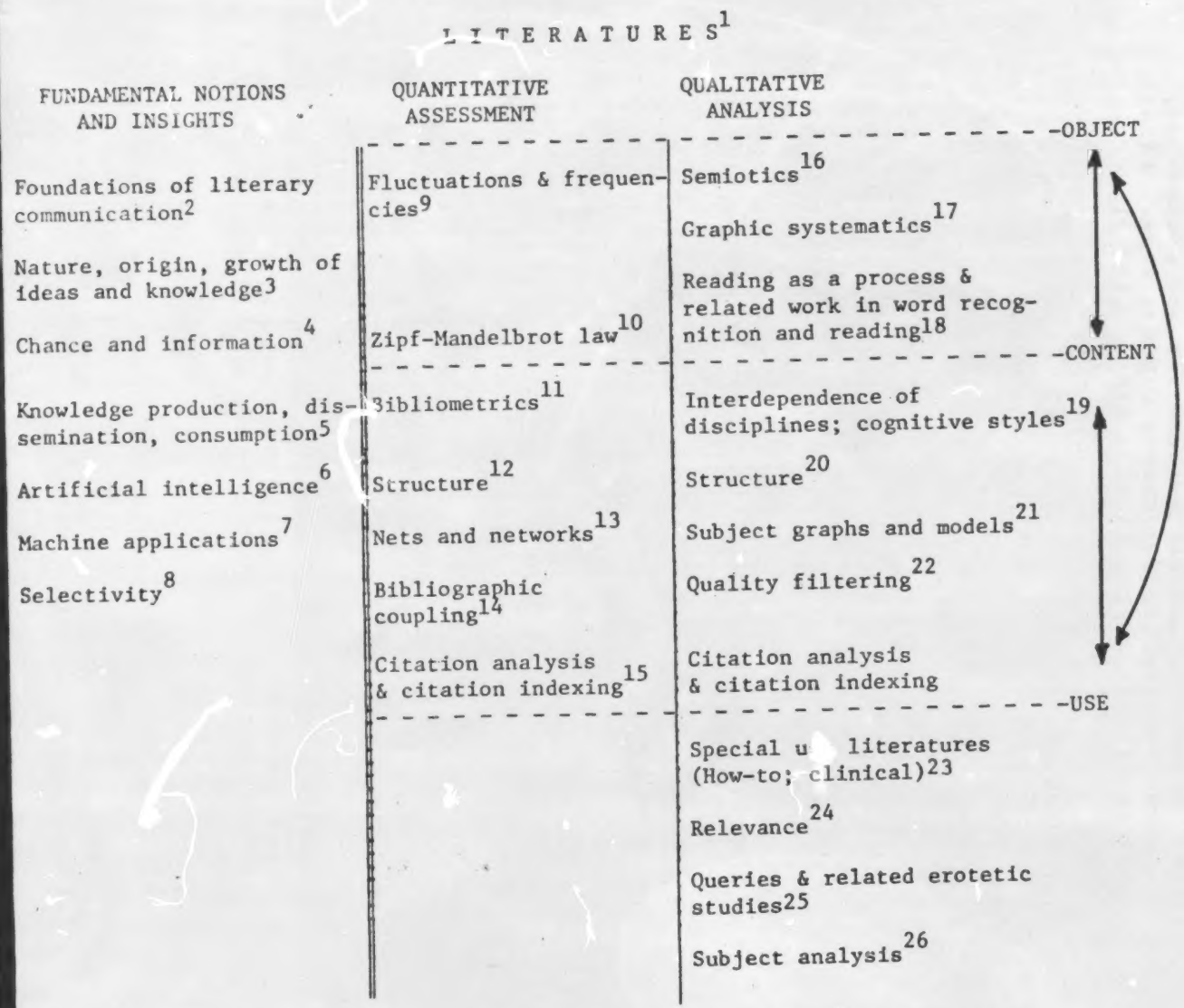
[32]Cf., e.g., Goffman and Shaw in Callebaut (1979), pp. 512-521.

[33]Hempel (1970), p. 653. The nature of the scientific task has been most succinctly stated by H.I. Marrou in Samaran (1961), p. 1526: Connaître: comprendre et expliquer.

[34]Slamecka (1975), ii-9, et passim.

[35]I.e., exponential increase of about 6 or 7% annually, a doubling in size every 10-15 years, and a tenfold increase in every generation of 35-50 years. Price (1961), chap. 5; and idem in Warren (1981), p. 5. Note also Holton (1962) on "branching."

[36]Warren (1981), p. ix.


LITERATURES[1]
FUNDAMENTAL NOTIONS AND INSIGHTS
QUANTITATIVE ASSESSMENT
QUALITATIVE ANALYSIS
-OBJECT
-CONTENT
-USE
Foundations of literary communication[2]
Nature, origin, growth of ideas and knowledge[3]
Chance and information[4]
Knowledge production, dissemination, consumption[5]
Artificial intelligence[6]
Machine applications[7]
Selectivity[8]
Fluctuations & frequencies[9]
Zipf-Mandelbrot law[10]
Bibliometrics[11]
Structure[12]
Nets and networks[13]
Bibliographic coupling[14]
Citation analysis & citation indexing[15]
Semiotics[16]
Graphic systematics[17]
Reading as a process & related work in word recognition and reading[18]
Interdependence of disciplines; cognitive styles[19]
Structure[20]
Subject graphs and models[21]
Quality filtering[22]
Citation analysis & citation indexing
Special u literatures (How-to; clinical)[23]
Relevance[24]
Queries & related erotetic studies[25]
Subject analysis[26]

Subnotes 1-26 in Main Topics of Ongoing Research

1 For purposes of general orientation and background, I suggest Buchler (1955); Cherry (1966); Pierce (1961); Laudan (1977); Kochen (1967); Ziman (1976); Morrison (1966); Fishman (1981); Gardner (1958); and Campbell (1982). The research literature prior to 1977 and doctoral research at Case Western Reserve University up to this date are listed in Rawski (1977), p. 23, notes 43,44, and 45.

2 Goffman & Warren (1980); William Goffman in Weiss (1977); Meredith (1966); Ziman (1968). On aspects of language, Sapir (1921); Woodger (1952); Bunge (1967), vol. 1, chap. 2; Wartofsky (1968), chap. 6; Chrry (1966); Meredith (1966); Popper (1975); Campbell (1982); and papers 5, 6, 9, and 10 in Danto & Morgenbesser (1960). Note also Gerbner (1969); and Y. Bar-Hillel in Scientific Thought (1972), chap. 6.

3 Buchler (1955); Gardner (1973); Merton (1973); Kuhn--Lakatos--Laudan, see Laudan (1977); Harre (1975); Kubler (1962); Gruber (1974); Kochen (1967); Kochen (1974); Ziman (1980); Campbell (1982). Epidemic, genetic, and diffusion models: Goffman, Warren, Shaw et al. cf. Goffman & Warren (1980); Warren (1981); Rockefeller Foundation (1978); Donohue (1973); and Mayr (1982), chap. 20.

4 John Von Neumann in Eigen & Winkler (1981); Holland (1975); Suppe (1978); Price (1976); Price (1978); Campbell (1982).

5 Machlup (1962); Machlup (1980); Rogers & Shoemaker (1971); Garvey (1979); Ziman in Elkana (1978), chap. 11.

6 Raphael (1976); Haugeland (1981); and the literature listed by Linda C. Smith in ARIST 15 (1980), chap. 3. Note also the discussion in Hofstadter & Dennett (1981); and Campbell (1982).

7 Cf. summaries like Fishman (1981); Eigen & Winkler (1981), chap 10; Davis & Rush (1979), chap. 7, et

passim. Still interesting, Leo Apostel in Piaget (1967), pp. 1078-1096;Bar-Hillel (1964), part iii; and Gerbner (1969), part IV. Note also ARIST 12 (1977), chap. 4.

8 Goffman, Warren, Bruer, Pao et al. Cf. Goffman & Warren (1980); Rockefeller Foundation (1978); Warren (1981); S. Cole in Elkana (1978), chap. 9.

9 Elkana (1978), chaps. 5, 8, and 9. Cf. applications like Benoit Mandelbrot in Lazarsfeld (1966); Pao (1978); Pao (1982); and, below, 10. Note also the ingenious vignettes in Mandelbrot (1977).

10 Arapov & Shreider (1978); Mandelbrot (1977); and the literature listed in Rawski (1977), p. 23, notes 43, 45.

11 Price (1976); Rawski (1977), p. 23, notes 43 , 44, 45; Narin (1976); and F. Narin & J.K. Moll in ARIST 12 (1977), chap. 2; Rawski (1977), p. 23, notes 44, 45. Note B.C. Brookes in Debons & Cameron (1975), pp. 449-456; and Goffman & Shaw in Callebaut (1979); Elkana (1978).

12 E.g., the work of William Goffman as summarized in Brookes (1973a); Brookes (1973b); Fairthorne (1969); Henry Small, Belver C. Griffith, and others-- cf. Elkana (1978); Price in Warren (1981), pp. 11-16; and Shaw (1981). Note also S. Natanabe in Scientific Thought (1972), chap. 7.

13 D. de S. Price in Kochen (1967), pp. 145-155; Garfield in Warren (1981), chap. 11; idem in Rockefeller Foundation (1978), pp. 68-77; and in Elkana (1978), chap. 8; Donohue (1973), pp. 23-26. Also Brachman (1977); B.C. Griffith in Debons & Cameron (1975), pp. 457-481.

14 On this, Donohue (1973), pp. 26-28, et passim; Weinberg (1974); Garfield in Elkana (1978), chap. 8.

15 Garfield (1979); Warren (1981); Donohue (1973), pp. 23-26. B.C. Griffith in Debons & Cameron (1975), pp. 457-481. On quantitative analysis of scientific papers, authors, and citations in general, Menard (1971); Elkana (1978).

16 Slamecka (1975) and ARIST 14 (1979), p. 70. Meredith (1966), part II; Gardner (1973), esp. pp. 119-120; L. Tondl in Scientific Thought (1972), chap. 5.

17 Gerstner (1974); Kolers & Eden (1968), esp. chaps. 1 and 5; Dondis (1973); Garfield in Rawski (1973).

18 The remarkable work encouraged and published over the last 15 years by Merald Wrolstad in his Visible Language, as exemplified by "Visual Cues in Word Recognition and Readings," ed. K. Rayner, Visible Language 15 (1981), nos. 2 and 3.

19 Piaget (1967); Pantin (1968); Rawski (1973), pp. 116-146; Kaplan (1964), pp. 8, 269-272.

20 Rawski (1969); Rawski (1977); Gardner (1973); Goffman (1980).

21 Eugene Garfield, e.g., in Rawski (1973), 380-402; and in Elkana (1978), chap. 8; B.C. Griffith in Debons & Cameron (1975) pp. 457-481. Small & Griffith (1974).

22 Ezioni (1971); Pao (1975); Boyce & Primov (1977); Goffman in Warren (1981), pp. 41-46; Rockefeller Foundation (1978); Goffman & Warren (1980), chap. 6.

23 On clinical literature, D. de S. Price in Warren (1981), pp. 4-5; and ibid. chap. 9.

24 Saracevic (1970); Saracevic (1975); Goffman in Warren (1981), pp. 36-40.

25 Belnap & Steel (1968) with comprehensive bibliography of the theory of questions and answers. Kochen (1974); Saracevic (1978).

26 On subject analysis, D.M. Liston Jr. and M.L. Howder in ARIST 12 (1977), chap. 4; Davis & Rush (1979). Cf. also Richmond (1981).

> --"Silicon-based life would have a lot of advantages over carbon-based life," a young engineer told me once. He said he believed in a time when the machines would "take over." He snapped his fingers and said, "Just like that." He seemed immensely pleased with that thought. To me, though, the prospects for truly intelligent computers looked comfortably dim.[37]

Unremitting research effort provides the soul of the new machine about which Mr. Tracy Kidder, quoted above, wrote a captivating book that is as revealing as a document of our times as it is exasperating. Computers will support and deliver the research findings I have described--findings which, if properly related and projected, will indeed become the soul of the "new machine" that will constitute the access tool of the future.

(1) The first and foremost implication of the systemic nature of literatures bears out Husserl's deceptively casual phrase about the realm of truth having its compartments.[38] It will be knowledge, the subject, and its topical and disciplinary relations and proximities that will interact with the users of such an information system rather than "stored document descriptions."[39] Furthermore, object properties and use potential of specific literature units could be related to content aspects as well as to the requirements of a given mission--all of which invokes over the centuries some of the polymath musings of a Leibniz or a Daniel Georg Morhof.[40]

(2) The relentless growth of literatures,[41] time and again, has shown that "ultimately, our problem is one of selection and selective implementation, not of cumulation."[42] Recent work by Garfield, Goffman, Warren,

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[37]Kidder (1981), p. 241.
[38]Husserl (1928), pp. 5-6, as cited in Rawski (1973), p. 117.
[39]Weiss (1977), pp. 3-4.
[40]Feller (1718), pp. 18-26, 128-138; Morhof (1688), esp. Book i, chap. 2.
[41]Price (1961), chap. 5; idem in Warren (1981), pp. 5-7.
[42]Rawski (1966), p. 745.

and others has developed ways of dealing with the quantity-quality dilemma[43] by articulating concepts and techniques of a principle of selectivity. The systemic nature of literatures serving the ecosystem of scientific communication plays a decisive role in these studies.[44]

(3) Conversely, this nature has emphasized the applicability of the concept of information input overload and the relevant tactics and strategies.[45] As literatures grow it becomes more and more difficult to differentiate between literature units of high, low, or average quality within the mass of publications inundating us. As, some years ago, in a commencement address to graduates in library science at Case Western Reserve University, Dr. Kenneth Warren of the Rockefeller Foundation suggested that one could look upon literatures

> from the classic viewpoint of the Western movies--in terms of the good guys and the bad guys. The good guys, who add to our state of knowledge, make up only a small proportion of the total literature. In the relatively clean area of physical phenomena, it has been noted that, over a period of 40 years, a constant percentage of authors--only 10 to 14 percent--wrote up their work in such a way as could be said on subsequent inspection to contain useful information.[46] There is a vast middle area that includes the nondescript cowpokes and the horses, and then come the villains at the end.[47]

This appropriately Wild West analogy applies also to sub-problems of over-supply, such as content relationships, equivalence, proximity, and uniqueness-- and, over time, stability, life span, and obsolescence.

(4) In conclusion, this essay in the spirit of 'science observes' must stress the predictive dimension afforded by the results of reflective inquiry.

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[43] Goffman & Warren (1980), p. 15.
[44] Rockefeller Foundation (1978), passim.
[45] Miller (1978), pp. 158-159, et passim; Rifkin (1980), pp. 170-171.
[46] Branscomb (1968).
[47] Warren (1981), p. 26. On this, with utter candor, Quine (1974), p. 39.

Prediction as a forecast permits successful action and control; as a test it permits us to confirm or disconfirm our assumptions.[48] As mentioned before, prediction, be it now in absolute terms or in terms of probability, is based upon the explanations provided by research. Predictions based on the various logics-in-use[49] of familiarity are based on after-the-fact knowledge derived from sources and factors that remain unknown, because they have not been analyzed; hence, uncertain knowledge in the sense that it can be relied upon only as long as these unknown sources and factors obtain. It cannot cope with major change and cannot be generalized with reliable results, no matter how inclusive and precise its observation data may be. Such experiential knowledge may be eminently effective as a working base for individual action in a familiar situation at a given time and place, but it lacks the intelligibility which is obtainable only by reflective inquiry.[50]

The scientific study of the nature of literatures has not yet produced the balance of information elements and ordering relations, which Goffman and Harmon describe as "sufficient and ordered information."[51] Yet, increasingly, ongoing work moves toward deductively formulated and confirmed findings, which permit true lawlike statements that allow us to dispense with hopeful guesswork and to act with greater certainty amidst the rapidly increasing complexity of our semantic and semiotic environment. One day we may even have an adequate model and applicability theorem for an honest to goodness theory of information sources--many-splendored as it may have to be!

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[48]Bunge (1959b), pp. 310-311. Note also Benoit Mandelbrot in Piaget (1967), pp. 1097-1113.
[49]The term is Abraham Kaplan's; Kaplan (1964), pp. 8-9. On this, Rawski (1969), pp. 93-95.
[50]On this, Goodman (1965), pp. 59-66.
[51]Goffman & Harmon (1971), p. 103.

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SHAPING A BIBLIOGRAPHIC INSTRUCTION PROGRAM FOR UNDERGRADUATE SCIENCE STUDENTS:

APPLICATIONS OF A MODEL OF THE STRUCTURE OF THE SCIENTIFIC LITERATURE.

by
Thomas Kirk

Introduction

The challenge of building a bibliographic instruction program for science students which takes into account a model of the structure of the literature is professionally an exciting activity. It is also a practical necessity. The success of any bibliographic instruction program is, to some extent, determined by how well the instruction in the use of the library reflects the process of science and the structure of its literature.

It is my task today to discuss concepts for the design of bibliographic instruction programs for undergraduate science students which are derived from Dr. Rawski's model.

Preliminary to sketching these concepts I want to first review what I believe are the essential points of Dr. Rawski's talk, and second, mention factors other than the model of the literature which are critical to the design of an instruction program. If the import of what I have to say today is to be understood, I must make it clear that I do not believe we can or should try to teach undergraduates the structure of the scientific literature by making it the central organizing theme of our bibliographic instruction. I believe students can gain a working knowledge of that structure as a result of subject background and a series of significant experiences using the literature. These experiences should be aided by a formal program of instruction centered on selected reference tools and useful search strategies.

Dr. Rawski's Talk

I know it is presumptuous of me to immediately summarize a talk which you have just heard. However from the perspective of the practitioner trying to learn from what Dr. Rawski has said today I found myself

focusing on certain key concepts, which I believe are critical in shaping a program.

Dr. Rawski has made what for me are five main points in his talk.

1) The scientific research literature is a body of material which consists of a series of units which have been added over a period of time. Each of these bits stores, displays, and transmits the results of a research effort. These bits cannot be changed or deleted.

2) The succeeding units of research literature may contradict, amend, amplify or extend the ideas presented previously. Succeeding literature may also ignore some parts of the previous literature. In other words the scientific research literature consists of a series of units created over time. Those units remain in existence forever. However, because scientists read the literature, subsequent units have some relationship to previous units.

This leads to a third point which Dr. Rawski makes.
3) The scientific research literature records the evolution of ideas over a period of time. Therefore one can not only get the current understanding of a physical phenomena from the recent literature, but by reviewing the older literature one can see the growth and development of an idea. Dr. Rawski has called the literature a living system. While I would quibble that it is the scientific ideas which are the living system nonetheless the literature is a reflection of that growth and change which characterize both life and scientific ideas.

4) The fourth point on which I want to focus is Dr. Rawski's description of the scientific literature, and here I refer to all forms, not just the research literature, on the basis of three characteristics. He has labeled this triad the O-C-U syndrome. The "O" characteristic is the physical entity or package which contains the information; the "C" is the content or information contained in the package; and "U" is the use that the content was intended to serve.[1]

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[1]Rawski, Conrad H. "Subject Literatures and Librarianship." In Library School Teaching Methods: Courses in the Selecton of Adult Materials, edited by L.E. Bone. p. 92-113. Urbana, IL: University of

5) Fifth and finally Dr. Rawski has mentioned the quantity vs. quality dilemma, and the problem of selectivity in dealing with the scientific literature.

Other Factors

As I have indicated there are factors other than a model of the scientific literature which must be taken into account in developing an instruction program. In fact I could easily spend the rest of my time reviewing the extensive literature which deals with these issues.[2] Instead I want to limit my comments to those two which have a critical effect on the application of the model of the literature to the design of an instruction program.

The first of these is the college student's lack of knowledge and experience with basic general reference materials and literature research procedures. I would like to put this defficiency in terms of Piaget's sequential stages of cognitive development.[3,4] Piaget has described four developmental stages; two of which are normally completed about the age of eight. The other two are related to our concerns today. The second of these two is formal reasoning which is characterized, in a nutshell, by the ability to analyze. This includes a

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Illinois Press, 1969.

[2]Bibliographic Instruction Handbook. Policy and Planning Committee. Bibliographic Instruction Section of the Association of College and Research Libraries. Chicago, 1979. 69 p.

Hardesty, Larry. Instructional Development in Library Use Education. In Improving Library Instruction: How to Teach and How to Evaluate edited by Carolyn H. Kirkendall, p. 11-36. Ann Arbor: Pierian Press, 1979.

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[3]Mellon, Constance A."Perry and Piaget: Theoretical Framework for Effective College Course Development." Education Technology 21:(5): 29-33 (May, 1981).

[4]ADAPT Workshop. Module 2: Concrete and Formal Thought. Lincoln: University of Nebraska, 1978.

a number of aspects including correlational reasoning, combinational reasoning, and the ability to separate and control variables. As those of you who have experience with undergraduates know, students are not capable of formal reasoning in their use of the library until they have had a significant number of experiences using the library. Instead we see a pattern in which, to quote Constance Mellon, they:

> are capable of logical thought, but only concerning actual concrete objects and situations...[5]

To continue with Mellon's description of Piaget's third developmental stage:

> concrete reasoners are able to sort and classify objects or events into categories, can arrange objects into a serial order, and can understand a hierarchy. Students who function at this stage are also able to follow step-by-step directions, as long as each step is clearly specified. However, the individual tends to reason in an unsystematic way and is generally not aware of his or her own reasoning processes. Additionally, concrete reasoners remain unable to deal adequately with abstract or hypothetical situations and ideas.[6]

Let me apply this theory to the realm of bibliographic instruction and library use by first and second year undergraduates. In general our concrete reasoning undergraduate users expect to find a World Book, dictionary, card catalog, and the Readers' Guide in an academic library, and if given a list of other encyclopedias, dictionaries and H.W. Wilson indexes, they can distinguish and group them by type. If however one volume encyclopedias, handbooks, newspaper indexes, abstracting services, and a serial record were given to them they would have significant problems grouping them and characterizing each group. Furthermore it is not likely they can describe their process of library research nor can they match a type of reference source to their information need.

Therefore our task is to take students through aspects of the development of reasoning from their concrete stage to the formal stage which is necessary if

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[5]Mellon, p. 29
[6]Mellon, p. 29

they are to be able to use a variety of search strategies based on an information need and a model of the structure of the literature.

As an aside I would strongly commend to you the ADAPT workshops on College Teaching and the Development of Reasoning. ADAPT is a project of the University of Nebraska at Lincoln which began several years ago to attempt to find ways to help students develop their reasoning power. The project resulted in the development of a multidisciplinary freshman program.[7] But the significant outcome of the project for me and I think for librarians are the techniques of teaching reasoning and the sharpening of Piaget's concepts which so clearly describe undergraduate students' problems in effectively using library resources.

The second factor which needs to be taken into account in designing an instruction program is the students' lack of knowledge about the subject. While students most likely are taking a course or courses in the general subject area of their library research, they will not have a working knowledge of the field. They are not scientists going to the literature for the answers to specific questions. Instead, they are going to the literature to learn--to learn about a subject; its development and current status, its methodology, the important workers in the field, and the important literature resources on the subject. Because of the importance of this subject knowledge factor you will note later, in the model program that I propose, that no timing is indicated. This will depend on the subject area in which the program is introduced and the amount of subject knowledge needed.

I cannot leave students' lack of subject knowledge background without commenting on this as an excuse not to include library use in undergraduate science programs. All too often faculty will express the point that undergraduates cannot "read" the scientific literature in their field and therefore should not be forced to deal with it. I would argue that knowing the subject field, while helpful, is not the only factor necessary for effective library use. Students must also be familiar with the reference tools, which can occur as

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[7]Fuller, Robert G. Piagetian Programs in Higher Education. Lincoln: University of Nebraska, 1980. 179 p.

a result of repeated uses over a period of time. The solution of the problem is not to postpone the experience but to design the library use assignment and instruction in such a way that the student will gain the specific subject background necessary as they use the literature.

As a result of a series of those structured experiences the student will gain an expertise in the use of the literature which is comparable to their expertise in the subject area.

Directions for creating an instruction program for science students

We turn now to my major task: what are the implications of Dr. Rawski's model for the development of bibliographic instruction programs for undergraduate science students? While I have qualified the task in terms of audience and educational level I believe my comments are also applicable to students in areas of the social sciences and for most beginning graduate students in both the sciences and social sciences. I should point out at this point that these comments do not apply to instruction on science reference materials in situations where non-sicence students will be using only tertiary scientific sources.

These then are some considerations in the design of a bibliographic instruction program for undergraduate science students based on Dr. Rawski's model of the structure of the scientific literature and the two aspects of students' backgrounds which I have outlined above.

1) While it certainly is a cliche I must start by saying the instructional program should be gradiated. The ultimate objective is to provide the students' with the ability to independently use a model of the scientific literature. However the students' backgrounds and the complexity of the scientific literature make it impossible to effectively present everything at one time. Therefore a program of library instruction must be provided in stages with each succeeding stage built on the previous ones. There must be enough stages to provide the requisite practice to make students proficient users. My best guess is that five or six complete literature research projects and two or three more limited projects which involve single types of sources such as handbooks are needed to provide the necessary experiences.

I have provided you with an example of such a program in the handout that is around the room (Appendix I). The instructional content of each component of this program is listed to show the important elements and when they are introduced. It also shows the relationship of one content element to another. I am sure there are questions and comments on this proposed program. I have tried to anticipate them in the rest of my comments. At the conclusion I would welcome questions and discussion from the floor.

2) A program of bibliographic instruction must be provided in the context of some specific subject matter. Without this context to provide the grist for the literature model mill the instruction program must be more general and theoretical. For example instruction on the McGraw-Hill Encyclopedia of Science and Technology and other subject encyclopedias must be very general and theoretical unless their use can be illustrated within a specific subject area.

3) The instructional content should focus on specific reference and literature sources couched in an overall structure or search strategy. For example in component 1 the presentation of initial sources should focus on a specific source, in this case, the McGraw-Hill Encyclopedia of Science and Technology. The instructional content should focus on four aspects - 1) similarities and differences in comparison with encyclopedias students already know, b) the audience (i.e. purpose) of the encyclopedia, c) the function for which the student should use it--overview and bibliography, and d) the tool's place in the search strategy. This approach should be used as each new tool is introduced.

This concept is based on Dr. Rawski's O-C-U syndrome and the realization that students are concrete reasoners in terms of library knowledge.

4) As a related matter, the instruction should differentiate between the three types of sources: tertiary, secondary, and primary. This differentiation should be based on the difference in and intended audience of the three types, and what I call the distance of each type from the original research activity. For example the instruction might examine a textbook section, a review article, and a research article, by aksing such questions as "Who wrote the piece?" "For whom was it intended?" "What is its purpose?" "What is the relationship to the original

research activity?" At the same time the student should also be challenged to answer the questions "When should I use this type of literature?" and "What kinds of questions will each answer?" The examination of the three types of literature and their use is based on Dr. Rawski's literature as a living system, and his O-C-U syndrome.

This is an appropriate place to remind ourselves that our students should, if we are successful, outgrow the instruction we provide. Our introductory instruction should emphasize the differences between tertiary, secondary, and primary sources, and how they should be used in relationship to one another. Advanced undergraduate students usually will go directly to secondary sources, and graduate students usually will go directly to the primary literature with or without the assistance of an indexing or abstacting service. However because they have had the instruction and experience in using the literature, they have techniques that allow them to cope with situations when they cannot go directly. This phenomenon illustrates the importance of the interaction of students' knowledge of library resources and the subject area, and the structure of the scientific literature in determining what is appropriate for each component of an instruction program.

5) Primary attention should be given to the author and citation approach to the literature. One of the implications of this principle is the emphasis on bibliographies in reference sources and tracing of those citations. For example, in discussing encyclopedias, handbooks, and dictionaries their use as sources of bibliography should be emphasized. Not only does this reflect something of the structure of the literature, but helps to provide the kind of screening undergraduates need in order to deal with the quantity-quality dilemma Dr. Rawski described.

A second implication, and one which is not adequately recognized in practice today, is the importance of introducing citation indexes as reference tools. I know of no other tool which better reflects the structure of the scientific literature and still meets the basic needs of undergraduate students.

Having made such an emphatic statement I think it appropriate to say a little more about why citation indexes should be used by undergraduates. As I indicated the citation index reflects the structure of the literature. The indexes clearly display the

unitized nature of the research literature and that the units are contributed over time. The indexes also illustrate how the units of literature build on one another and that the development of scientific ideas has the qualities of a living system.

You may have sensed in what I've said earlier that there is a degree of conflict between teaching the structure of the literature and providing instruction which is appropriate to the students' library use skills and subject background. What makes me so enthusiastic about the citation indexes is that the conflict does not exist with respect to teaching the use of citation indexes. The indexes are relatively easy to use, and are sufficiently different from other indexes that students are forced to look at them without any preconceived notions. Furthermore, from the Piagetian perspective it is easy to relate the structure and use of citation indexes to the common practice of using bibliographic references in documents to find other material.

6) As a corollary to the emphasis on the citation approach to the literature, the full introduction of the comprehensive indexing and abstracting services should be reserved for students who have already had some experience with the scientific literature and the subject matter. I know that this idea runs counter to the wishes of many teaching faculty who want to introduce indexes such as Chemical Abstracts or Biological Abstracts early because of their perception that the indexes are central to the discipline and therefore a literature search in the discipline. What we must do to counteract this thinking is to demonstrate to faculty that undergraduate students do not have the requisite background to use comprehensive indexing and abstracting service effectively.

When instruciton in the use of comprehensive indexing/abstacting services of the discipline is presented care must be taken to reflect the variety of possible uses. Appendix II is an outline of the key concepts that should be emphasized at the points indexing/abstracting are to be discussed in the program.

This detailed examination of the indexing/ abstracting service is crucial in light of Dr. Rawski's points about the O-C-U syndrome, and the need for evaluative techniques because of the quantity-quality dilemma.

7) Our instruction should incorporate techniques which will help students evaluate sources as they proceed. This includes such things as using bibliographies in tertiary sources, subject tracings on catalog cards, emphasis on Annual Reviews and other review serials, and the use of citation indexes. This responds to the quantity-quality dilemma which Dr. Rawski mentioned.

Conclusion

I have presented today a series of 7 concepts, or ideas which I believe should guide the development of an instruction program based on the structure of the literature as described by Rawski and the students' familiarity with the subject matter and reference sources. These concepts include:

1. A gradiated program;
2. Instruction in the context of specific subject matter;
3. Focus on specific tools in the context of a search strategy;
4. Exploration of the definition and examples of the three types of literature (tertiary, secondary, primary);
5. The primary importance of the author and citation approach to literature searching;
6. The thorough and gradiated presentation of comprehensive indexing/abstracting tools, but only at the upper levels;
7. Incorporation of techniques for evaluating sources within the search strategy.

Search strategies are the orderly finding techniques for gathering needed information. An individual's repertoire of strategies is based on his knowledge of the literature's structure, his ability to formally reason about library resources, and his general knowledge of the subject matter. Students who have this repertoire of strategies have one of the most important skills scientists can have: the ability to learn from the scientific literature.

APPENDIX I

Ideal Bibliographic Instruction Program for Undergraduate Science Students

Goals and objectives for the overall program are those in the Association of College and Research Libraries, Bibliographic Instruction Handbook published in 1979.[8]

	Assigned Task	Instructional Content
1	Research for paper or oral presentation	* Orientation to Physical Facilities (if needed) * Basic search stragegy (encyclopedias, card catalog, and indexes): McGraw-Hill Encyclopedia of Science and Technology One or two subject encyclopedias Library of Congress Subject Heading Science Citation Index and appropriate H.W. Wilson indexes Local serial record or periodical holding file.
2	Assignment in conjunction with laboratory work.	* Use of handbooks. Would cover the two or three most useful for the subject area.

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[8]Available from ACRL at 50 E. Huron, Chicago, IL 60611 for $5.00 to ACRL members and $6.00 to non-members.

3	Research for paper, oral presentation or in preparation to set-up laboratory project.	(Based on 1) * Search strategy * Same tools as 1. * The indexing or abstracting service for the discipline. * Annual Reviews and review serials relevant to the specific subject.
4	Research for paper, oral presentation or in preparation to set-up laboratory project.	(Based on 3) * Same as 3 plus indexing and abstracting service from related disciplines (e.g., Chemical Abstracts for biologist.)
5	Research for paper, oral presentation or in preparation to set-up laboratory project.	(Based on 4) * Concept of reference tool selection as part of search strategy. * Appropriate guide to the literature or a library produced bibliography.
6	In conjunction with experimental project.	(Based on 2) * Basic search strategy for finding quantitative information * Additional handbooks. * Indexes to quantitative information.
7	Research for paper, oral presentation or in preparation to set-up laboratory project.	(Based on 5) * Use of on-line literature retrieval service. * Use of current awareness services and resources.
8	In conjunction with experimental project.	(Based on 6 and 7) * Alternative search strategies for finding specific factual

information. (e.g., methodologies, laboratory techniques, quantitative data).

9 Variety of possibilities.

(Based on 3)

* Introduction of special information formats.
  e.g. Geology--Maps
  Engineering--Standards
  Biology--Organism check lists
  Chemistry--Synthesis techniques
  All disciplines--Computer software

APPENDIX II

Content for instruction on indexing/abstracting services.

	Stage	Instructional Content
3	Introduction of indexing/abstracting services.	* Structure of index. * Concept of abstract, if appropriate. * Mechanics of use. * Use of index to search concrete terms. (e.g., organisms, chemical compounds, places, other physical entities). * Introduce thesarsus or index guide (relate to LC Subject Headings).
4	Use of second indexing/abstracting services.	* Introduction of second indexing & abstracting service. * Comparison of services.
5	3rd use.	*Indexing of concepts. * Detailed explanation of thesaurus or index guides, if appropriate.
7	Introduction of computer search service.	* Use of library's computer search service. * How computer search fits into search strategy. * Limits of printed index vs. computer indexing.
8 or 9	Specialized use of indexing/abstracting services.	* Detailed examination of special indexes or approaches to indexing. (e.g., Patent Index of Chemical Abstracts.

*Keyed to components in Appendix I.

A SUBJECTIVE SUMMARY
by
Ross Atkinson

Patrick Wilson's "Pragmatic Bibliography" is a paper primarily about people. Bibliography is something people do, and it is the divergent qualities of people--their individuality, presuppositions, prejudices, social relations--that form the essential basis for how bibliography (or research) is done. Pragmatic bibliography is characterized by a selectivity which is frequently highly subjective, and research is consequently viewed as something very irregular and unpredictable.

Professor Wilson does acknowledge the significance of sources, however, so that we end up with a kind of dialectical view of bibliography in which research is less like the user listening to a number of sources "out there" and rather more like a fast moving dialogue between the user and the sources. As is the case with any true dialogue, neither party is in complete control, and no one can predict how the conversation will proceed nor where it will end up.

Frances Hopkins has managed the difficult task of applying such a theory to bibliographic instruction by drawing a very potent distinction between research and what she defines as bibliographic inquiry. Patrick Wilson has supplied a view of what happens in the library: Frances Hopkins' argument--if I have understood it correctly--is that certain preconditions are necessary for the things that Dr. Wilson describes as happening to happen. Certain concepts must first be grasped, and these concepts form the basis of bibliographic inquiry. How such concepts are applied to actual research will necessarily vary enormously and unpredictably from individual to individual, but that such concepts must be available to be applied would appear incontestable. Supplying those concepts, then, is the pupose of bibliographic instruction. If research is indeed something like a dialogue with all of the attendant uncertainties, someone must still be responsible for supplying future dialecticians with an adequate language to carry on that dialogue.

It should perhaps be noted that there does appear to be a standard vicious circle inherent in this view, and we must recognize it if we are to deal with it. It is like the distinction in linguistics between competence and performance. Performance derives from competence, but competence is developed by performance. In the same way: while bibliographic inquiry may be a

precondition for research, we do not want to delude ourselves into imagining that our students are going to grasp completely the concepts of bibliographic inquiry on the basis of what we say to them. They will only thoroughly grasp those concepts subsequently on the basis of what they do in the library, and both Hopkins and Kirk have stressed the indispensibility of practical exercise. We are, of course, in the same position here as everyone else in education: we can only bring our students to the outer limits of the craft. Crossing the line between the craft and the art--between bibliographic inquiry and real research--is a step each student must take for himself or herself.

One further general observation does need to be made, I think, on the Hopkins paper: it appears to be indicative of a trend that we have begun to see recently, namely that library use instruction strictly speaking is coming to be regarded as a component--a very important component to be sure, but still only one component--of bibliographic instruction. And this remains true even if--or especially if--we consider library use to be the primary objective of bibliographic instruction. If bibliographic inquiry is the subject of the course Frances Hopkins has outlined, then bibliographic inquiry is concerned with matters that go far beyond library use--but matters that library use is nevertheless ultimately dependent upon. If you are familiar with the work of the learning theory school of BI, you know that the proponents of that school, although coming in many cases from an entirely different direction, are also part of this same trend.[1]

Conrad Rawski has provided us with a highly complex picture of literatures an sich. Literatures are seen as a system of interconnected parts that are inseparable but nevertheless distinguishable for purposes of observation. Dr. Rawski does acknowledge, however, the problematic of the individuality of use--especially in what he call manifest use, which means, if I have understood it correctly, the selection of particular sources on the basis of private, relativistic notions of their potential. Clearly Rawski's "manifest use" would appear to be one quality of Wilson's "pragmatic bibliography." Such use can only be determined after the fact, or at least currently only after the fact, since Dr. Rawski's paper does end with a vision of an eventual

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[1]See for example Cerise Oberman-Soroka, Petals Around a Rose: Abstract Reasoning and Bibliographic Instruction, Chicago: ACRL, 1981.

state of bibliographic predictability. Such predictability is seen, moreover, as a prerequisite for a true theory of information sources.

Thomas Kirk has applied aspects of Dr. Rawski's theory to an ideal program of instruction for undergraduate science students--a program in which students are provided with a view of bibliography as a set of instruments designed to solve problems. A key component of Kirk's ideal program is specificity: bibliography entails the use of specific instruments to solve specific problems on a specific subject. At the beginning of his paper he draws a sharp distinction between bibliographic instruments on the one hand and the structure of scientific literature on the other. BI is concerned with instruments and strategies, and BI should not and cannot use the structure of scientific literature as its central organizing theme. This structure is rather something the students will learn on their own through experience with the subject and the literature. Thus one of the questions arising from these papers would certainly appear to be what relationship--if any--exists between Kirk's dichotomy of bibliographic instrumentality and literature structure and the Hopkins distinction between bibliographic inquiry and research. I would only point out that we are in each case dealing with a system; and that means that although we may not be able to teach literature structure or research, we ourselves are nevertheless very much obliged to understand them as thoroughly as possible if we are going to teach bibliographic inquiry or the manipulation of bibliographic instruments.

Finally, let me also emphasize that Thomas Kirk is specifically addressing problems of science BI, i.e., BI for students who are used to--or are very rapidly becoming used to--viewing the world as a collection of objects "out there" -- things that can with the aid of specialized instruments be taken apart, put together, measured, and predicted. When we teach BI to science students, therefore, it would indeed seem beneficial both to exploit the kind of bibliographic theory that Dr. Rawski has provided--a theory that views literature as a living system and aims ultimately at predictability --and to apply that theory in such a way as Thomas Kirk has done with his carefully constructed instrumental method.

I do not mean to imply, of course, that we are faced with an all or nothing choice of one perspective over another. Certainly science BI should contain some warning of the relativity of knowledge and the unavoidability of subjectivity in library research.

(The Heisenberg Principle of Uncertainty might be used for this purpose: it would be comprehensible to science stduents, and it could perhaps be applied very neatly to Patrick Wilson's caveat of indeterminacy). On the other hand, humanities BI cannot be practically conducted without recourse to some form of instrumentalism. In each case, I think, one perspective should be stressed, but not to the total exclusion of the other.

NOTES ON THE SPEAKERS

Patrick Wilson

Dr. Wilson's professional experience includes: Reference Librarian and Librarian for South Asian Studies at UC Berkeley; and faculty member in the Department of Philosophy, UCLA. Since 1965 he has been on the faculty of the School of Librarianship at Berkeley, and he was Dean of the School from 1970 to 1975. His publications include Two Kinds of Power (Berkeley, 1968); "Situational Relevance," in Information Storage and Retrieval (1973); Public Knowledge, Private Ignorance (1977); "Some Fundamental Concepts of Information Retrieval," Drexel Library Quarterly (1978); "On the Use of Records and Research," with Mona Farid, Library Quarterly (1979); "End of Specificity: Recently Announced Subject Cataloging Practices at the Library of Congress," Library Resources and Technical Services (1979); and "Limits to the Growth of Knowledge: The Case of the Social and Behavioral Sciences," Library Quarterly (1980).

Frances L. Hopkins

Ms. Hopkins is Coordinator of Reference Services, Samuel Paley Library, Temple University, Philadelphia, Pennsylvania. She received this appointment in 1980, and she previously served as Head of Reference and then NEH/CLR Project Coordinator, Franklin and Marshall College, Lancaster, Pennsylvania. Ms. Hopkins, long active in library use instruction, was a participant in the Bibliographic Instruction Section's 'Think Tank' that was held at the preconference in July 1981 in San Francisco and which produced a list of recommendations for bibliographic instruction (College and Research Libraries News, December 1981). Her publications include "User Education in the College Library: Origins, Prospects, and a Practical Program" in College Librarianship (Scarecrow, 1981) and "A Century of Bibliographic Instruction: The Historical Claim to Professional and Academic Legitimacy," College and Research Libraries, May 1982.

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Thomas G. Kirk

Mr. Kirk is College Librarian, Hutchins Library, Berea College, Berea, Kentucky. Prior to accepting this position in 1980, he served as Acting Director of the Library/Learning Center, University of Wisconsin-Parkside, Kenosha, Wisconsin, and as Science Librarian, Earlham College, Richmond, Indiana. Mr. Kirk will serve as Chairperson of ACRL's College Libraries Section in 1982-83, and he is also active in other ACRL sections. His publications include "Problems in Library Instruction in Four Year Colleges," in Educating the Library User (Bowker, 1974); Course Related Library and Literature Use Instruction: Working Models for Programs in Undergraduate Science Education, (Norton, 1978); and "Structuring Services and Facilities for Library Instruction," Library Trends (1980).